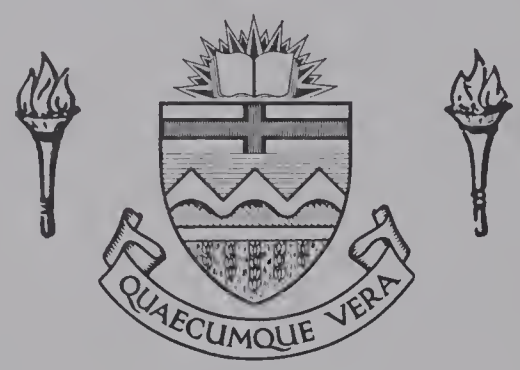

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THE INFLUENCE OF MONETARY AND FISCAL POLICIES ON STOCK PRICES IN CANADA

by

© F. David Coombs

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE

EDMONTON, ALBERTA

SPRING, 1972

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled THE INFLUENCE OF MONETARY AND FISCAL POLICIES ON STOCK PRICES IN CANADA submitted by F. David Coombs in partial fulfilment of the requirements for the degree of Master of Business Administration.

ABSTRACT

This study was designed to find empirical evidence regarding the influence of monetary and fiscal policies on stock prices in Canada, on a long run basis.

In order to achieve that objective multiple regression was used with two different techniques; stepwise multiple regression and the Almon distribution lag technique. Both quarterly and annual data were used.

The measure of monetary policy was the money supply and the interest rate. For fiscal policy the measure was full-employment surplus or deficit.

All 13 equations developed in the study were run in both current and constant prices. The results for money supply were best in current prices. The results for interest rate and full-employment surplus or deficit were best in constant prices. However, all together, the results were much better in current prices.

Two time periods were used, 1950-66 and 1950-70. The results were improved, R^2 increased by four percent, by extending the time period from 1966 to 1970.

The results of this study showed that monetary policy had a predominant influence on stock prices in Canada. The response of stock prices to monetary policy relative to fiscal policy was larger, more predictable and faster. Overall, the results dealing with fiscal actions were inconsistent, theoretically unjustifiable, and statistically insignificant.

ACKNOWLEDGEMENTS

I would like to express my appreciation to Dr. S. P. Singh for his time and effort spent in the supervision of my thesis. I would also like to thank Dr. J. Dunn and Dr. R. Patterson for serving on my committee.

My thanks go to Linda Magnuson and Maxine Mahowich for typing the thesis.

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CHAPTER I

INTRODUCTION

Considerable research has been done to analyze the movements of stock prices in the last twenty years. Many variables have been used in the empirical tests; GNP, corporate earnings dividends, taxes, public spending, interest rate, money supply and recently expectations and inflation.

This study is intended to determine the relative and total influence of monetary and fiscal actions on stock prices and to see if the results obtained using the Canadian data are similar to other studies. Money supply and interest rate are used as the measure of monetary policy. Full-employment surplus or deficit is the measure used for fiscal policy.

The objective of this study is twofold: (1) to determine the influence of money supply, interest rate and full-employment surplus or deficit on stock prices, and (2) to determine the distributed lag effect of money supply and full-employment surplus or deficit on stock prices.

The distributed lag effect of money supply and full-employment surplus or deficit will be determined by use of the Almon distribution lag technique.[1] This technique will allow one to see the influence of money supply on stock prices, quarter by quarter and then the sum or total influence. This enables one to see how long one must wait before the money supply has its major effect on stock prices. The same is true for full-employment surplus or deficit.

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[1] Shirley Almon; "The Distributed Lag Between Capital Appropriations and Expenditures", Econometrica, Vol. 33, No. 1 (January, 1965), pp. 178 - 196.

As an independent variable in determining the influence of fiscal policies on stock prices, full-employment surplus or deficit is a relatively new concept. Most other studies have used taxes or public spending as a measure of fiscal policy.

The time periods used for this study are 1950-66 and 1950-70. Annual and quarterly data is used in both current and constant prices for both the time periods. Besides full-employment surplus or deficit being used as the measure for fiscal policy, another difference in this study from others is the use of data unadjusted for seasonal variation.

The decision to use unadjusted data is based on the following assumption: when investors make day to day decisions about the stock market they do not use seasonally adjusted data. Therefore, regression analysis need not use seasonally adjusted data. O.M.B. economists[2] conclude that seasonally adjusted data results in distorted and misleading forecasts.

This study has important policy implications both from the viewpoint of the individual investor and/or individual business institution and the policy maker. Since the stock market is an important source of equity funds for investment, an understanding of its behavior is important to both investors and corporations. Insofar as the stock prices influence plans, corporations will find this study helpful. The individual investor may find that the findings of this study will help him to

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[2]O.M.B. stands for the Office of Management and Budget which is directed by President Nixon's right-hand man, George P. Shultz.

work out his investment strategy and help him to discover profitable investment opportunities.

Since an explanation of the behavior of stock prices will provide a better understanding of the operations of the capital market, the policy maker who seeks to create a suitable economic environment for investment can use the findings of this study in his formulation of monetary and fiscal policy.

The plan of presentation is to first cover the methodology to be used. Within this chapter the variables will be defined and multiple regression will be discussed. The chapter following the methodology will deal with the analysis of the results. The analysis is discussed in two parts, stepwise multiple regression and the Almon distribution lag technique. The paper will finish with a chapter of summary and conclusions.

CHAPTER II

METHODOLOGY

This chapter examines the methodology used to determine the influence of monetary and fiscal policies on stock prices. It explains the different equations used in the regression analysis. Part one discusses the nature of the variables and the sources of data. Part two of the chapter discusses the general nature of regression analysis in three sections; assumptions of regression analysis, stepwise multiple regression and multiple regression using the Almon distribution lag technique.

Definition of the Variables

Stock Prices

The dependent variable for the regression models in this study is stock prices. Stock prices are represented by an index of Common Industrial Canadian stocks.[1] The Dominion Bureau of Statistics compiled the index on the basis of Thursday's closing quotations. The list of stocks is a representative sample and the number included in the index fluctuates. For example, in 1950 there were 82 companies included in

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[1]The original data was as follows: the years 1950-60 were on a base year of 1935 - 39 = 100, 1961-69 were on base year 1956 = 100, and 1970 was on base year 1961 = 100 (See Appendix A, Table A-1). D.B.S. conversion method A was used to change all figures to 1961 = 100. This method involved a conversion factor obtained from a ratio. Following is the procedure used in obtaining the factors used:

Year	Base Year	Base Year	Base Year
	1935-39	1956	1961
1961	325.6	130	100

1956 Factor = 100/130 = .76923
1935-39 Factor = 100/325.6 = .30712

The figure for each quarter was multiplied by the appropriate factor to get the 1961 based figures (Appendix A, Table A-2).

the index, in 1962 there were only 66, and in 1970 there were 80. The figures are in constant prices and are listed in Appendix A, Table A-2.

Money Supply

In determining the definition of money supply to be used, three definitions are developed. They are as follows:

M1 - Total Cash Reserves

M2 - Currency outside bank plus chartered bank deposits (including Government of Canada deposits) less float less personal savings and non-personal term and notice deposits.

M3 - Currency outside banks plus chartered bank deposits (including Government of Canada deposits) less float.

Appendix A, Tables A-4, A-5 and A-6 contain the figures in current prices. Different equations were run with each definition and the best results were obtained with M2. This is theoretically justifiable. Therefore, all results shown in this paper will be with money supply being defined as M2.

Interest Rate

The interest rate used is the discount rate as reported in the International Financial Statistics and is recorded in Appendix A, Table A-8.

Full-Employment Surplus or Deficit

Full-employment surplus or deficit figures are calculated on the basis of information provided by the Economic Council of Canada. First, potential GNP is computed. The procedure used is demonstrated in Appendix C, Exhibit C-1. Once potential GNP is calculated, full-employment surplus or deficit figures are calculated. Appendix C, Exhibit C-2

demonstrated the procedure used for calculating full-employment surplus or deficit figures.

In the computation of full-employment surplus or deficit two major points need clarification. The first point deals with the computation of potential GNP. Using the Economic Council of Canada's procedure and the same sources of data, the percentage GNP gap figures computed were not the same as the Economic Council of Canada's. Thus, the full-employment surplus or deficit figures also varied. The Economic Council of Canada explained this to the fact that from 1956-66 a 4.8 percent growth rate was used and from 1966-70 a growth rate of 5.2 percent was used. These growth rates are averaged out over the period and therefore does not show the actual annual growth rates. The Economic Council of Canada uses this method so that it will be comparable to U. S. high employment data in the "Economic Report to the President."

Appendix A, Tables A-10 and A-12 show the difference between the Economic Council of Canada figures[2] and the ones computed in this study.[3]

The second point is that the estimates for full-employment surplus or deficit will likely be conservative because:

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[2]The Economic Council of Canada figures were available only from 1956 to 1970 on an annual basis in current prices. Thus, the annual figures from 1950 to 1955 and all quarterly figures were calculated using their procedure.

[3]The figures for full-employment surplus or deficit for this study were computed by using the same procedure as that of the Economic Council except that the growth rates needed for computing potential GNP figures are actual annual growth rates. This should provide more accurate potential GNP figures. The Economic Council of Canada suggested they are also likely to switch to this method.

The growth rate used for the period 1950-55 was calculated and found to be 5.9 percent.

a. We have made no adjustment to increase the surplus (or reduce the deficit) by the amount of unemployment insurance benefits that would not have had to be paid out at full-employment. In 1970, total unemployment insurance benefits amounted to around $700 million. At a 3.8 percent level of unemployment, a good part of this would have been saved.

b. We have calculated the revenue short fall by applying an average tax rate to the GNP "gap" figure. In fact, the marginal rate would be somewhat higher.[4]

Implicit Price Index

The implicit price index (Appendix A, Table A-13) is used to equate current prices of the independent variable to the common base year of 1961. The constant figures for the independent variables are in Appendix A; Table A-7 is the money supply figure, Table A-9 is the interest rate figures, and Table A-11 is the full-employment surplus or deficit figures. Since stock prices are in constant figures to start with the implicit price index was used to convert them to current figures and are contained in Table A-3 in Appendix A.

Regression Analysis

Assumptions of Regression Analysis

Regression analysis is a method used for estimating the influence of independent variables on dependent variable. The simplest functional form is a linear equation expressed by the following equation:

$$Y = a + bX + u$$

where Y is the dependent variable, a is the intercept, b is the increase in Y for each unit of increase in X (or the slope of the regression line), X is the independent variable, and u is a random

---

[4] R. B. Crozier, "Procedure Used in Computing Full Employment Surplus or Deficit" (Worksheet for the Economic Council of Canada, July 9, 1971).

error term used to explain the variation of the actual value of Y from the regression line. It is important to include the residual u, because most economic data frequently contain errors of measurement, so that they are only an approximation to the underlying true values. Also, there may be forces acting upon the dependent variable that are not included in the equation.

Multiple regression differs from simple regression in that more than one independent variable is used to explain the dependence of Y. It can be expressed by the following equation:

$$Y = a + b_1X_1 + \ldots + b_nX_n + u$$

where Y is the dependent variable, a is the intercept, b_j is the coefficient of the independent variables, X_i are the independent variables, and u is the residual value.

The validity of statistical inferences, which are made regarding the population from the analysis of data from a representative sample, is dependent on the degree to which the assumptions of regression analysis are satisfied.

The first assumption is that of linearity. The tests for this assumption are provided in the following figures where stock prices is plotted against each of the independent variables; money supply, interest rate and full-employment surplus or deficit in constant prices. Although not included, current figures were also plotted and there was no difference in the relationships than is shown using constant figures.

There is no question as to the linear relationship between stock prices and money supply and stock prices and interest rate. However, Figure 2-2 indicates that there is neither a linear nor non-linear

FIGURE 2-1
STOCK PRICES PLOTTED AGAINST MONEY SUPPLY IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-70

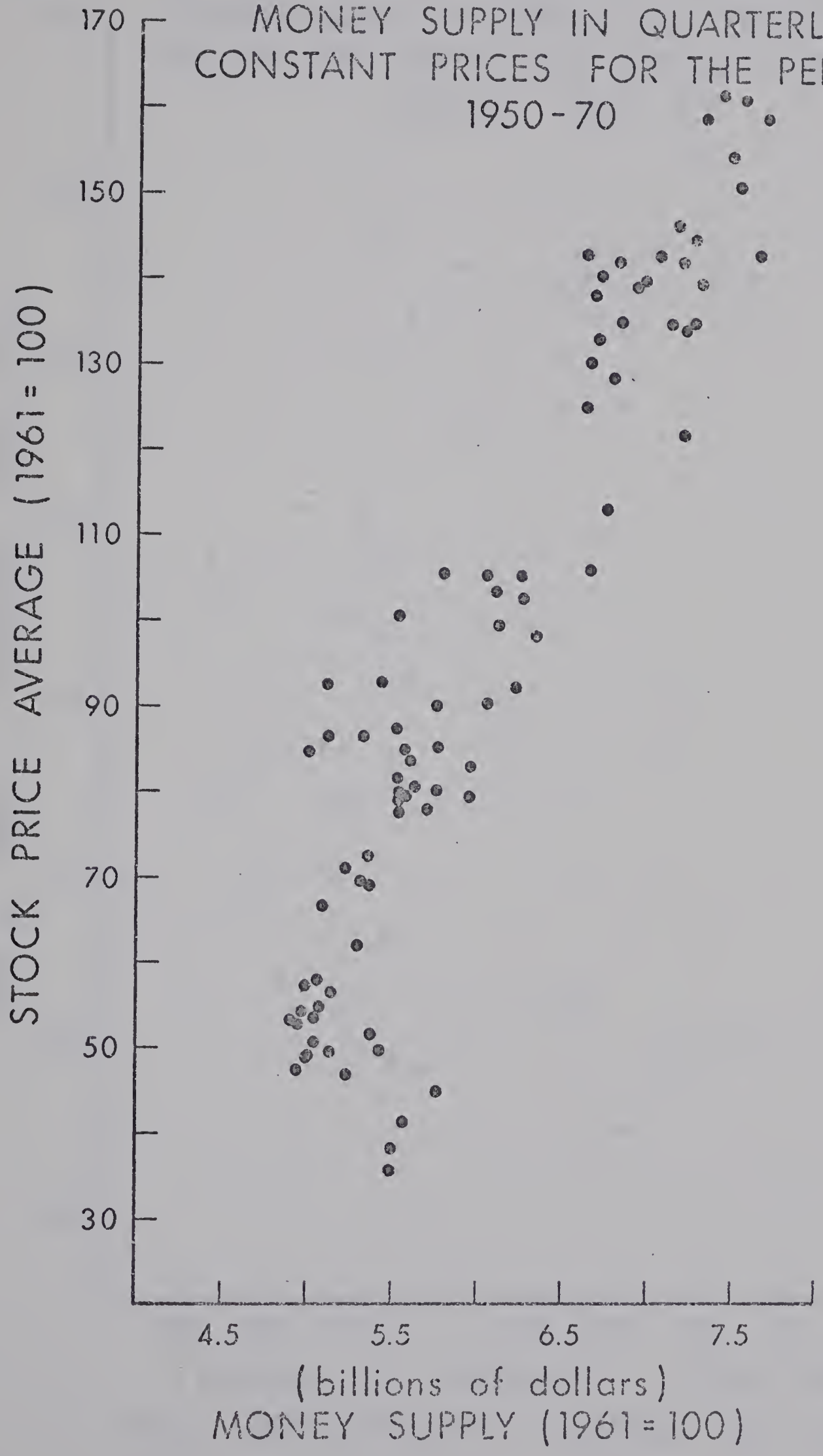


FIGURE 2-2
STOCK PRICES PLOTTED AGAINST FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-70

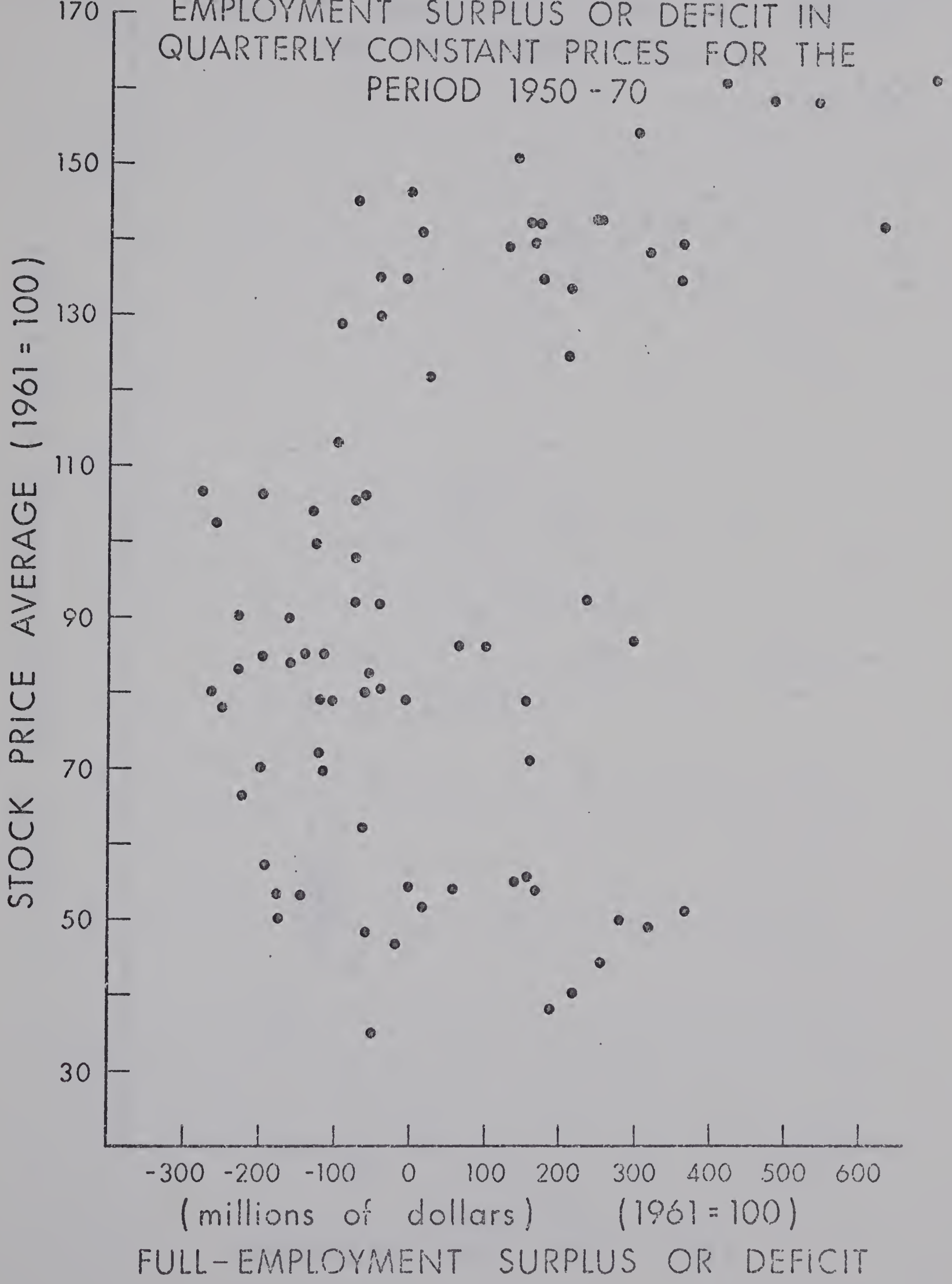
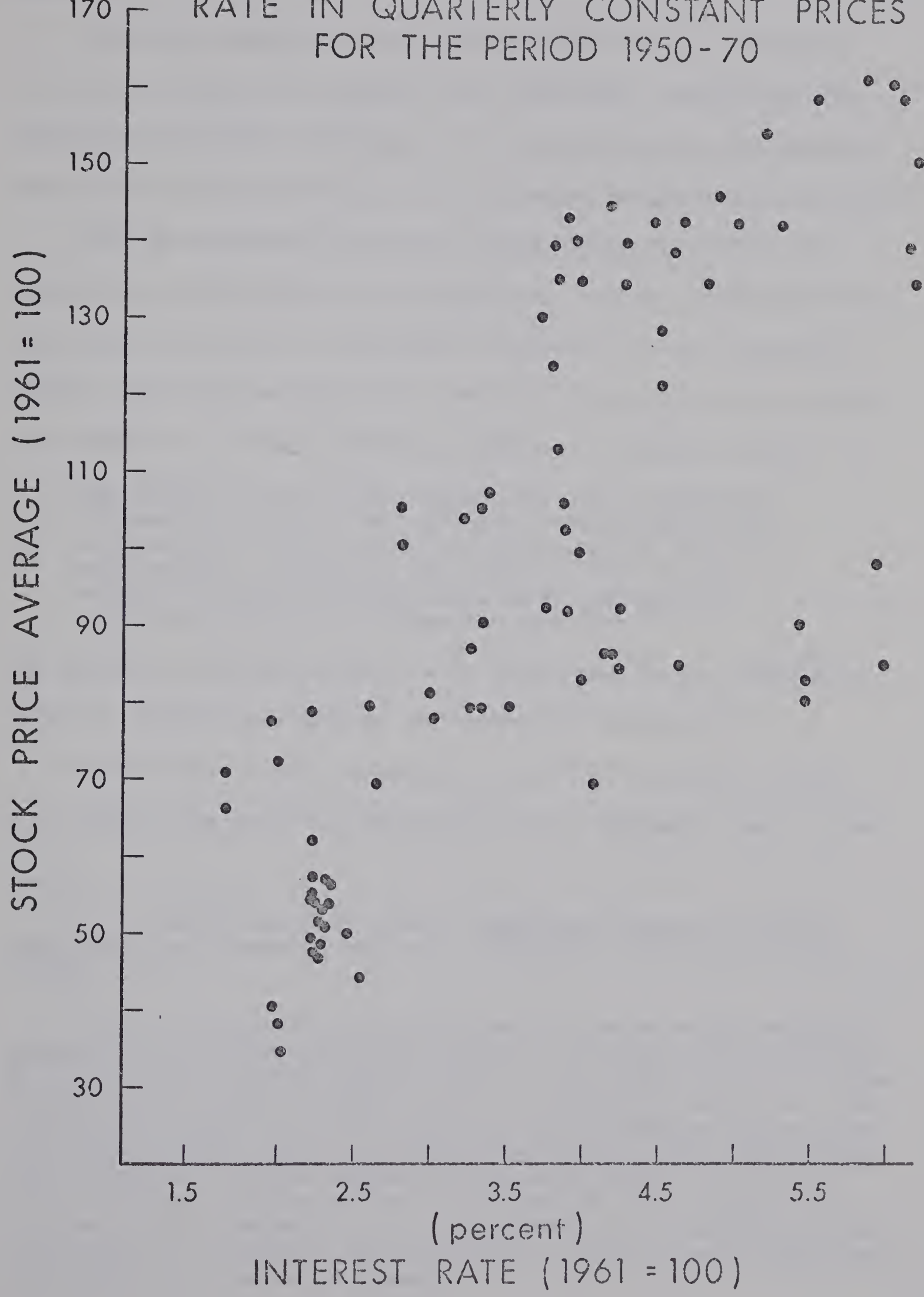


FIGURE 2-3
STOCK PRICES PLOTTED AGAINST INTEREST RATE IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-70



relationship between stock prices and full-employment surplus or deficit.

The second assumption deals with multicollinearity. Multicollinearity is said to be present if the independent variables of the regression are highly correlated. It is assumed that a high degree of correlation between any two of the independent variables does not exist.

When the explanatory variables become highly correlated, the regression co-efficients may be unreliable. That is, collinearity affects the reliability of individual co-efficients in the regression. However, this does not alter the predictive power of the total regression equation. William A. Spurr and Charles P. Bonini's stated:

> The standard error of the estimate may not be increased. The sampling error of the regression co-efficients tend to compensate for each other in the estimate of the dependent variable. Similarly, the sampling error of the multiple correlation co-efficient is not sensitive to collinearity among the independent variables.[5]

The problem of multicollinearity will be analyzed by the simple correlation co-efficients between the independent variables.[6]

The third and fourth assumptions relate to the residual value, u. First, the property of homoscedasticity is assumed. That is, the

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[5]W. A. Spurr, and C. P. Bonini, Statistical Analysis for Business Revisions (Homewood, Illinois: Richard D. Irwin, Inc., 1967), p. 611.

[6]Correlation analysis is a technique that measures the degree of change in one variable as another variable is changed. If an increase of 1 unit in one variable always leads to an increase of 1 in the value of the other variable, a perfect positive correlation exists, i.e. the correlation co-efficient would equal +1. If an increase of 1 unit in one variable always leads to a decrease of 1 unit in the value of the other variable, a perfect negative correlation exists, i.e. $r = -1$. If absolutely no relationship exists between the two variables (i.e. they vary purely randomly) $r = 0$. The correlation co-efficient is usually tested as to whether the relationship is statistically significant according to the size of the sample.

standard deviation of the residuals is constant for all values of the independent variables. Also, the residual values should be normally distributed and their expected value is zero.[7]

The last assumption assumes that the residual values are independent of each other. When the residuals are serially correlated to one another, as is often the case in time series analysis, it is known as autocorrelation. When autocorrelation is present, the estimates of the co-efficients are unbiased, but they are not randomly distributed around the regression line.[8]

The Durbin-Watson statistic will be used to test for autocorrelation.[9] Each Table with results contains a Durbin-Watson statistic for each equation. When the computed value is smaller than the observed value there is positive autocorrelation.

If the above assumptions are satisfied, the regression co-efficients and standard error of estimate computed from a sample are efficient, linear and unbiased estimators of the true population values.[10]

---

[7]When scatter of the residual value, u, is not uniform, a mathematical transformation of the data may make the assumption valid (i.e. convert Y to log Y). For a discussion on this, see W.A. Spurr and C.P. Bonini, Statistical Analysis for Business Revisions, (Homewood, Illinois: Richard D. Irwin, Inc., 1967), p. 638.

[8]Mordecai Ezekiel and Karl A. Fox, Methods of Correlation and Regression Analysis, (New York: John Wiley and Sons, Inc., 1959), p. 334.

[9]For a detailed discussion on the Durbin-Watson statistic, see J. Durbin and G. S. Watson, "Testing for Serial Correlation in Least Square Regression", Biometrika, Vol. 38 (1951), pp. 159-177.

[10]W. A. Spurr and C. P. Bonini, Statistical Analysis for Business Revisions (Homewood, Illinois: Richard D. Irwin, Inc. 1967), p. 611.

When using the model for predictive purposes, the economic conditions must continue to be similar if the predictions are to be of use.

Stepwise Multiple Regression

Stepwise multiple regression allows the independent variables to be chosen one at a time to enter into the regression according to which one has the highest partial correlation with the dependent variable. This procedure lets one see the added influence to the total regression of each new variable.

Stepwise multiple regression runs were made using both annual and quarterly data.[11] With both sets of data, current and constant prices were used. The following shows the equations used for each combination:

Equation

(2-1) $Y = a + b_1M + b_2I + b_3F$

(2-2) $Y = a + b_1M + b_3F$

(2-3) $Y = a + b_1M$

(2-4) $Y = a + b_2I$

(2-5) $Y = a + b_2I + B_3F$

(2-6) $Y = a + b_3F$

(2-7) $Y = a + b_1M + b_2I$

---

[11]Runs with annual data were made in order that a comparison of results could be made to see how much improvement, if any, is made in the results using quarterly data.

where Y = stock prices

a = intercept

b_i = co-efficients of the independent variables

M = money supply

I = interest rate

F = full-employment surplus or deficit

Almon Distribution Lag Technique

In order to consider lags in an empirical study, monthly or quarterly data is required. Quarterly data is used in this study with the Almon distribution lag technique. Various equations are used as the technique requires some trial and error runs to determine the best lag and shape of the curve, i.e. the degree of polynomial.[12]

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[12]"By constraining the distribution of co-efficients to fit a polynomial curve of n degrees, it is designed to avoid the bias in estimating distributed lag co-efficients which may arise from multi-collinearity in the lag values of the independent variables. The theoretical justification for this procedure is that the Almon constrained estimate is superior to the unconstrained estimate, because it will create a distribution of co-efficients which more closely approximates the distribution derived from a sample of infinite size. In order to minimize the severity of the Almon constraint, the maximum degree is equal to one more than the number of lags of the independent variables up to five lags." Michael W. Keran, "Expectations, Money, and the Stock Market", Federal Reserve Bank of St. Louis Review (January, 1971), p.20, footnote 16.

This same procedure was followed in this paper and follows the convention established by Shirley Almon in her original article, "The Distributed Lag Between Capital Appropriations and Expenditures", Econometrica, (Janaury, 1965). It should be noted that this is also, basically the same procedure as Leonall C. Anderson and Jerry L. Jordon, used in their article "Monetary and Fiscal Action: A Test of Their Relative Importance in Economic Stabilization", Federal Reserve Bank of St. Louis Review (November, 1968), pp. 11-24.

The standard form of equations used with the Almon distribution lag technique are as follows:

Equation

(2-8) $Y = a + b_3 M\ (A\ B\ C)$

(2-9) $Y = a + b_2 F + b_3 M\ (A\ B\ C)$

(2-10) $Y = a + b_1 I + b_2 F + b_3 M\ (A\ B\ C)$

(2-11) $Y = a + b_1 I + b_2 F\ \ (A\ B\ C) + b_3 M\ (A\ B\ C)$

(2-12) $Y = a + b_2 F\ (A\ B\ C) + b_3 M\ (A\ B\ C)$

(2-13) $Y = a + b_2 F\ (A\ B\ C)$

where Y = stock prices

a = intercept

b_i = co-efficients of independent variables

M = money supply

I = interest rate

F = full employment surplus or deficit

A = degree of the polynomial plus one

B = number of lags

C = determines the shape of the curve[13]

Many combinations with each of the above equations are run with both current and constant prices and for the two time periods, 1950-66 and 1950-70.

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[13]The shape of the curve is determined by fixing the ends, i.e. C can take on four values: 1 which fixes the far end, 2 which fixes both ends, 3 which fixes the near end, and 4 which fixes neither end - both ends open. See Apendix B, Exhibit B-3 for diagrams illustrating the four alternatives.

CHAPTER III

ANALYSIS

This chapter discusses the results obtained through simple and multiple regression equations developed in the previous chapter to determine the influence of fiscal and monetary policies on stock prices.

The first part of this chapter deals with stepwise multiple regression equations. The second part is concerned with multiple regression using the Almon distribution lag technique. The discussion is carried within a theoretical framework enabling one to draw meaningful conclusions.

The study is concerned with long-run movements of stock prices. The time periods from 1950-66 and 1950-70 are used.[1]

Stepwise Multiple Regression

This section deals with the first seven equations outlined in the previous chapter. Each equation is used four times, once with current prices and once with constant prices for both the time periods 1950-66 and 1950-70.

Tables 3-1 through 3-7 contain the results. Each table is ordered in the same manner as the equations appear in Chapter II. For example, equation 1 in Table 3-1 corresponds to equation 2-1 in Chapter II.

---

[1] In computing full-employment surplus or deficit figures, total revenue is required as an input and is only available on a quarterly basis back to 1950. Money supply figures used are only available to 1949.

Time Period 1950-66 With Quarterly Data

Using the total response concept[2], which means including direct and indirect influences, stock prices are expected to be positively related to the money supply and negatively related to interest rates and full-employment surplus or deficit.

The results for the time period 1950-66 in current and constant prices are presented in Tables 3-1 and 3-2, respectively. The co-efficients of the supply of money are all positive and statistically significant at the one percent level in both current and constant prices. The t-values are very high. The t-values for money supply, when compared to the t-values of full-employment surplus or deficit, indicate that the response of stock prices to monetary actions is more predictable than the response to fiscal actions.

The corresponding t-value for the full-employment surplus or deficit co-efficients indicate that except for two cases all the co-efficients are statistically insignificant. Only in current prices and for equations 1 and 2 (Table 3-1) the co-efficients are significant at the five percent level. At the one percent level they too are insignificant.

The signs of the full-employment surplus or deficit co-efficients are not consistent. The signs in equations 1, 2 and 5 in Table 3-1 are opposite to the expected sign. If these co-efficients were not

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[2]For a discussion on direct and indirect (total response concept) influence see: L.C. Anderson and J. L. Jordon, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization", Federal Reserve Bank of St. Louis Review (November 1918), pp. 16-17.

TABLE 3-1

STEPWISE MULTIPLE REGRESSION RESULTS IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value X_1	T - Value X_2	T - Value X_3	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_3
1	.92	10.45	.73	-86.40	.0293	.0140	2.1298	17.10	1.77	1.39	.0017	.0079	1.5270
2	.92	10.45	.68	-89.59	.0311	.0136	-	27.71	1.70	-	.0011	.0080	-
3	.92	10.51	.61	-89.03	.0310	-	-	27.28	-	-	.0011	-	-
4	.58	24.00	.40	12.43	-	-	21.8397	-	-	9.46	-	-	2.3094
5	.58	24.28	.42	12.17	-	.0124	21.9611	-	.67	9.44	-	.0186	2.3263
6	.00	36.83	.02	83.30	-	-.0013	-	-	-.04	-	-	.0283	-
7	.92	10.54	.64	-85.99	.0293	-	2.0169	16.81	-	1.30	.0017	-	1.5504

TABLE 3-2

STEPWISE MULTIPLE REGRESSION RESULTS IN QUARTERLY CONSTANT PRICES FOR THE PERIOD

1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value			Standard Error of Regression Coefficient		
								X_1	X_2	X_3	X_1	X_2	X_3
1	.78	14.50	.58	-133.24	.0342	-.0029	6.2531	10.17	-.27	3.19	.0034	.0105	1.9617
2	.74	15.37	.46	-147.20	.0402	-.0062	-	13.54	-.55	-	.0030	.0112	-
3	.74	15.17	.45	-147.53	.0403	-	-	13.65	-	-	.0030	-	-
4	.41	22.75	.31	26.26	-	-	17.4820	-	-	6.80	-	-	2.5700
5	.41	23.10	.31	26.29	-	-.0006	17.4726	-	-.03	6.71	-	.0168	2.6041
6	.01	29.60	.04	84.08	-	-.0125	-	-	-.58	-	-	.0216	-
7	.78	14.28	.58	-133.27	.0342	-	6.3062	10.24	-	3.25	.0033	-	1.9380

statistically significant the change in sign may not be disturbing.

As mentioned already, the co-efficients in equation 1 and 2 are significant at the five percent level. However, this is true only when full-employment surplus or deficit is accompanied by money supply in the equation. It does not hold with just full-employment surplus or deficit and interest rate (Tables 3-1, equation 5). Also, it will be noted later that this is true only for the time period 1950-66. Therefore, these results may have occurred either because full-employment surplus or deficit was not a good measure of fiscal actions, or because of some unknown influence in the sample period.

An examination of the size of the co-efficients will also support the view that monetary actions exert a larger influence on stock prices than do fiscal actions.

The interest rate co-efficients do not follow the expected sign. For both current and constant figures the signs are positive. However, this can be explained for two reasons.

First, during the war and early post-war years, interest rates were regulated by the government in order to regulate bond prices. It was not until the 50's that interest rates were allowed to fluctuate according to market conditions. There has been a secular upward trend in interest rates since 1955 and in stock prices since 1950. (See Appendix A, Tables A-8 and A-9 and A-2 and A-3, respectively).

The second explanation has to do with the changes in interest rates and the range within which these changes occur. Interest rates generally fluctuate frequently within a narrow range in which stock prices are inelastic. Only in a limited number of cases were changes in the elastic zone. Therefore, positive signs in the interest rate co-efficients are

expected in time series regression.

All the interest rate co-efficients are significant at the ten percent level. All but two (equations 1 and 7, Table 3-1) are significant at the one percent level. The best results for interest rate are obtained using constant prices while in the case of money supply and full-employment surplus or deficit the best are obtained using current prices.

When using current prices (Table 3-1), an examination of the R^2 and standard error of estimate indicate that money supply is the most important of all explanatory variables. When money supply is alone in the equation (equation 3) an R^2 of .919 is obtained. In other words, 91.9 percent of the total variation in stock prices is explained by the money supply. By adding full-employment surplus or deficit into the equation an additional .03 of one percent of the variation is explained (R^2 of .922). By adding interest rate with the other two independent variables an R^2 of .924 is obtained or an additional .02 of one percent is explained. The changes in the standard error of estimate are also very slight, 10.51 to 10.45. Such a marginal improvement does not seem to have any significance.

It is important to note that, for example, the .02 of one percent contributed by the interest rate to the explained variation does not imply that if left alone in the equation interest rate would only explain .02 of one percent. By itself, in the equation,interest rate explains 57.5 percent of the total variation.

When using constant prices (Table 3-2) a similar analysis is made. The only difference is the change in the size of the values. For

example, equation 3, when money supply is alone in the equation, R^2 is .74 instead of .92 as it was in current prices. The standard error of estimate becomes much larger, 15.17 compared to 10.51. The co-efficients also become larger but the t-values get smaller, except for the interest rate which has already been discussed. Thus, the results are similar for both constant and current prices.

Table 3-3 contains the F-ratios, which represents the ratio of explained variation to the total variation, for equations in Tables 3-1 and 3-2. The only equation which is not significant at the five percent level is equation 6 for both current and constant prices.

TABLE 3-3

ANALYSIS OF VARIANCE FOR THE REGRESSION EQUATIONS FOR THE TIME PERIOD 1950-66 IN CURRENT AND CONSTANT PRICES

Equation	F - Ratio In Current Prices	F - Ratio In Constant Prices	Degrees Of Freedom
1	260.4	73.6	67
2	384.0	92.4	67
3	744.0	186.4	67
4	89.4	46.3	67
5	44.6	22.8	67
6	.0	.3	67
7	376.7	112.0	67

The problem of multicollinearity is illustrated in Tables 3-4 and 3-5. In Table 3-4 the simple correlation co-efficients for money supply and full-employment surplus or deficit, money supply and interest rate, and interest rate and full-employment surplus or deficit in current prices are -.07, .76 and -.08 respectively. The corresponding values in constant prices are (Table 3-5) -.04, .56 and -.11. For a

sample of 68 observations any simple correlation co-efficient over .24[3] is statistically significant at the five percent level.[4] Thus, only the correlation between money supply and interest rate is significant. This, however, does not distort the overall results. According to J. Johnston[5] multicollinearity does not hamper the predictive power of the regression equation in forecasting if it is expected to continue in the future.

TABLE 3-4

SIMPLE CORRELATION CO-EFFICIENTS BETWEEN INDEPENDENT VARIABLES IN CURRENT PRICES FOR THE PERIOD 1950-66

Variables	Stock Prices	Money Supply	Full-Employment	Interest Rate
Stock Prices	1	.9584	-.0055	.7585
Money Supply	.9584	1	-.0670	.7607
Full-Employment	-.0055	-.0670	1	-.0781
Interest Rate	.7585	.7607	-.0781	1

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[3]Samuel B. Richmond, Statistical Analysis (The Ronald Press Company, New York, Second Edition, 1957), p. 582.

[4]Ibid. See pp. 461 - 465 for a discussion on statistical inference in correlation analysis.

[5]J. Johnston, Econometric Method (New York, McGraw-Hill Book Company, 1963), p. 207.

TABLE 3-5

SIMPLE CORRELATION CO-EFFICIENTS BETWEEN INDEPENDENT VARIABLES IN CONSTANT PRICES FOR THE PERIOD 1950-66

Variables	Stock Prices	Money Supply	Full-Employment	Interest Rate
Stock Prices	1	.8594	-.0709	.6420
Money Supply	.8594	1	-.0417	.5630
Full-Employment	-.0709	-.0417	1	-.1053
Interest Rate	.6420	.5630	-.1053	1

Tables 3-1 and 3-2 contain the computed Durbin-Watson statistic for each equation. In Table 3-1, equation 1, the computed Durbin-Watson statistic is .73. Any value below 1.36 is statistically significant at the one percent level. Since .73 is the highest computed value from Tables 3-1 and 3-2, one can conclude that positive autocorrelation is present. The presence of autocorrelation implies that the residuals are not randomly distributed about the regression line. J. Johnston suggests the following three main consequences of autocorrelation:

> First, we shall obtain unbiased estimates of (b_1, b_2, b_3,...) but the sampling variances of these estimates may be unduly large compared with those achievable by the slightly different method of estimation. Second, if we apply the usual least-square formula for the sampling variances of the regression co-efficients, we are likely to obtain a serious underestimate of these variances. In any case, these formulas are no longer valid, nor are the precise forms of the t and F tests... Third, we shall obtain inefficient predictions, that is, predictions with needlessly large sampling variances.[6]

[6] J. Johnston, Econometric Methods, (New York: McGraw-Hill Book Company, Inc., 1963), p. 179.

No attempt was made to remove autocorrelation. However by using annual data in current prices autocorrelation is removed; one gets a Durbin-Watson statistic as high as 1.63.

Time Period 1950-66 With Annual Data

The results for the time period 1950-66 in current and constant prices with annual figures are presented in Tables 3-6 and 3-7, respectively. The difference between the results with annual and quarterly data can be compared by comparing the Tables 3-6 and 3-7 with Tables 3-1 and 3-2, respectively.

The results with annual data are similar except for three things. First, the size of the co-efficients change. In current prices (Table 3-6) the co-efficients for money supply are much smaller but are significant at the one percent level. As a result the t-values are not as large as before. For example, equation 1 in Table 3-1, the t-value for the co-efficient of money supply is 17.10 and in Table 3-6 it is 9.09.

Where the full-employment surplus or deficit co-efficient was positive and significant at the five percent level for equations 1 and 2 (Table 3-1), though still positive they are no longer statistically significant (Table 3-6).

The interest rate co-efficients are also smaller. With quarterly data they were statistically significant when accompanied by money supply in the equation. They are now statistically insignificant at the five percent level. Only when interest rate appears by itself or with full-employment surplus or deficit, is its co-efficient statistically significant at the five percent level.

TABLE 3-6

STEPWISE MULTIPLE REGRESSION RESULTS IN ANNUAL CURRENT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value X_1	T - Value X_2	T - Value X_3	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_3
1	.95	9.53	1.49	-91.56	.0077	.0042	1.2313	9.09	.81	.38	.0008	.0052	3.1748
2	.95	8.92	1.45	-93.53	.0080	.0039	-	16.71	.79	-	.0005	.0050	-
3	.95	8.53	1.53	-92.87	.0079	-	-	16.94	-	-	.0005	-	-
4	.65	22.72	1.60	4.59	-	-	24.2826	-	-	5.25	-	-	4.6294
5	.65	24.05	1.63	3.56	-	.0072	24.7185	-	.53	5.13	-	.0136	4.8158
6	.00	38.20	.13	83.09	-	-.0048	-	-	-.21	-	-	.0220	-
7	.95	9.09	.95	-91.49	.0077	-	.8448	9.27	-	.27	.0008	-	3.1002

TABLE 3-7

STEPWISE MULTIPLE REGRESSION RESULTS IN ANNUAL CONSTANT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value X_1	T - Value X_2	T - Value X_3	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_3
1	.83	14.41	1.33	-147.48	.0093	-.0037	5.4823	5.18	-.50	1.24	.0018	.0075	4.4373
2	.81	14.18	1.25	-162.28	.0107	-.0059	-	7.70	-.80	-	.0014	.0074	-
3	.80	13.56	1.06	-162.48	.0108	-	-	7.85	-	-	.0014	-	-
4	.49	21.98	1.17	17.03	-	-	20.2858	-	-	3.76	-	-	5.3887
5	.49	23.49	1.19	16.84	-	.0006	20.3502	-	.05	3.56	-	.0125	5.7152
6	.02	30.34	.21	83.84	-	-.0091	-	-	-.56	-	-	.0163	-
7	.83	13.54	1.29	-146.78	.0092	-	6.0069	5.31	-	1.43	.0017	-	4.1920

The second difference appears in the R^2 values. These values are increased from 2.9 percent to 3.1 percent when money supply alone is in the equation. When only interest rate and/or full-employment surplus or deficit is in the equation the values are increased from 7.2 percent to 7.6 percent. Also, the standard error of estimate is decreased. Thus, by the use of annual data the results improve except the smaller values for the co-efficients.

Third, the presence of autocorrelation is no longer found in some of the equations (equation 1, 2, 3, 4, and 5 in Table 3-6), using current prices. Autocorrelation is present using constant prices.

Time Period 1950-70 With Quarterly Data

The results for the time period 1950-70 are included in Tables 3-8 with current data and 3-9 with constant data. By extending the time period by four years some interesting changes in the results are observed. First, the R^2 values in current prices are increased by a range of 3.6 percent to 27.6 percent. However, the largest increases occur when money supply is not in the equation. That is, with just interest rate and/or full-employment surplus or deficit the range of increase is 20.6 percent to 27.6 percent.

An examination of the co-efficients and t-values for equations 4, 5 and 6 in Tables 3-8 and Table 3-1 will show that even though the R^2 values have increased approximately 20 percent or more, they are not that large. However, with the increase they are now all significant at the ten percent level and full-employment surplus or deficit co-efficient (by itself - equation 6) is significant at the one percent level. However, the sign remains positive and therefore is theoretically

TABLE 3-8

STEPWISE MULTIPLE REGRESSION RESULTS IN QUARTERLY
CURRENT PRICES FOR THE PERIOD
1950 - 70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value			Standard Error of Regression Coefficient		
								X_1	X_2	X_3	X_1	X_2	X_3
1	.96	10.78	.61	-71.52	.0264	.0024	2.2139	18.62	.42	1.59	.0014	.0057	1.3924
2	.96	10.81	.57	-74.89	.0283	.0037	-	36.70	.64	-	.0008	.0057	-
3	.96	10.71	.59	-76.29	.0286	-	-	43.62	-	-	.0007	-	-
4	.78	24.63	.55	3.78	-	-	24.4162	-	-	17.12	-	-	1.4849
5	.79	24.58	.58	7.84	-	.0197	24.0567	-	1.52	13.97	-	.0129	1.7225
6	.28	44.84	.35	95.55	-	.1131	-	-	5.58	-	-	.0203	-
7	.96	10.66	.62	-72.30	.0265	-	2.2957	19.04	-	1.67	.0014	-	1.3719

TABLE 3-9

STEPWISE MULTIPLE REGRESSION RESULTS IN QUARTERLY
CONSTANT PRICES FOR THE PERIOD
1950 - 70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	Interest Rate X_3	T - Value			Standard Error of Regression Coefficient		
								X_1	X_2	X_3	X_1	X_2	X_3
1	.87	13.32	.62	-127.20	.0333	-.0033	5.9857	13.03	-.44	3.62	.0026	.0074	1.6514
2	.85	14.20	.49	-143.78	.0396	-.0011	-	19.94	-.14	-	.0020	.0079	-
3	.85	14.03	.49	-143.14	.0395	-	-	21.87	-	-	.0018	-	-
4	.60	23.31	.44	15.39	-	-	21.9149	-	-	10.99	-	-	1.9932
5	.60	23.25	.47	18.60	-	.0196	20.7836	-	1.56	9.87	-	.0126	2.1055
6	.14	34.09	.18	93.08	-	.0626	-	-	3.59	-	-	.0174	-
7	.87	13.17	.60	-125.52	.0330	-	5.9274	13.37	-	3.62	.0025	-	1.6380

unjustifiable.

Similar results are obtained with constant prices (Table 3-9) and when compared to results in Table 3-2 with constant prices for the time period 1950-66, similar conclusions are arrived.

Second, from Table 3-10 which contains the F - ratios for the time period 1950-70, one concludes that all equations in Tables 3-8 and 3-9 are significant at the five percent level.

TABLE 3-10

ANALYSIS OF VARIANCE FOR THE REGRESSION EQUATIONS FOR THE TIME PERIOD 1950-70 IN CURRENT AND CONSTANT PRICES

Equation	F - Ratio In Current Prices	F - Ratio In Constant Prices	Degrees Of Freedom
1	654.6	185.5	83
2	944.8	236.3	83
3	1,902.8	478.3	83
4	293.0	120.9	83
5	150.0	62.7	83
6	31.2	12.9	83
7	973.7	281.0	83

Third, the problem of multicollinearity for this period is more severe than for the period 1950-66. Tables 3-11 and 3-12 contain the simple correlation co-efficients. The minimum value is now .21.[7] All of the simple correlation co-efficients are significant at the five percent level. However, as mentioned earlier, even though the individual regression co-efficients are made unreliable by the presence of multicollinearity, the predictive power of the regression equation is not affected.

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[7] S. B. Richmond, Statistical Analysis, (The Ronald Press Company, New York, Second Edition, 1957), p. 582.

TABLE 3-11

SIMPLE CORRELATION CO-EFFICIENTS BETWEEN INDEPENDENT VARIABLES IN CURRENT PRICES FOR THE PERIOD 1950-70

Variables	Stock Prices	Money Supply	Full-Employment	Interest Rate
Stock Prices	1	.9791	.5249	.8839
Money Supply	.9791	1	.5234	.8851
Full-Employment	.5249	.5234	1	.5183
Interest Rate	.8839	.8851	.5183	1

TABLE 3-12

SIMPLE CORRELATION CO-EFFICIENTS BETWEEN INDEPENDENT VARIABLES IN CONSTANT PRICES FOR THE PERIOD 1950-70

Variables	Stock Prices	Money Supply	Full-Employment	Interest Rate
Stock Prices	1	.9239	.3681	.7719
Money Supply	.9239	1	.4044	.7297
Full-Employment	.3681	.4044	1	.3452
Interest Rate	.7719	.7297	.3452	1

The regression results presented in this chapter indicate that money supply is by far the most significant variable affecting stock prices. Without money supply in the equation interest rate becomes highly significant. The results pertaining to full-employment surplus or deficit are not any where near as good as those pertaining to monetary actions. Also, when the full-employment surplus or deficit coefficient is statistically significant it has a sign opposite to what

is expected.

The following section lags money supply and full-employment surplus or deficit to see if the results are improved.

Almon Distribution Lag Technique

One of the difficult problems in explaining movements of stock prices is the lag effect of the independent variables. The problem of lags between monetary and fiscal policies and stock prices is sometimes complicated by lags between monetary and fiscal policies and economic activities. Stock prices directly reflect changes in monetary and fiscal policies without flowing through economic activities.[8] However, this effect can be sustained only if it is supported by changes in GNP. GNP, a measure for economic activity, is only an intermediate variable between stock prices and monetary and fiscal policies. With GNP as an intermediate variable, the problem of the relative importance of monetary and fiscal policies in determining the GNP is equally applicable to stock prices.

A study on the lag effects of monetary actions was conducted by Beryl W. Sprinkle[9]. He found that changes in stock prices lagged monetary changes by 15 months during a bear market and 2 months during a bull market. He also found that stock prices lagged economic activity by 20 months. Thus, stock prices led changes in economic activity by 5 months (during a bear market).

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[8] S. P. Singh, F. David Coombs, and Vern Krishna, "An Analysis of General Movement In Stock Prices" (unpublished: 1972).

[9] B. W. Sprinkle, Money and Stock Prices (Homewood, Illinois: R. D. Irwin, Inc., 1964), pp. 115 - 142.

The lag between monetary actions and economic activity is longer than the lag between monetary actions and stock prices. Thus, stock prices is a lead variable to economic activity and a lag variable to monetary actions.[10] The lag between monetary actions and economic activity is also longer than the lag between fiscal policy and economic activity. This being the case, fiscal action effects are seen earlier than monetary action effects on economic activity and on stock prices.

The Almon distribution lag technique allows one to include in the same equation variables with different distributed lags and/or unlagged variables. Since the length of the distributed lag is not known in advance, it is necessary to make various runs with different lags and then choose the best one. This is also true for determining the shape of the curve, i.e. in determining the value of C in the parenthesis (A B C).

Tables B-1 and B-2 in Appendix B contain the results of the combinations used in determining the value of C to be used. In all cases when C is equal to four, except for four equations, an error message was obtained. This was due to the fact that the matrix was not positively definite. Of the four equations for which results were obtained only one contained a sum of the co-efficient that was statistically significant at the five percent level. Thus, the value of four for C was eliminated.

The results are virtually the same when C is equal to one, two or three. Exhibit B-3 in Appendix B illustrates possible shapes when C

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[10] B. W. Sprinkle, Money and Stock Prices (Homewood, Illinois: R. D. Irwin, Inc., 1964), p. 115

takes on different values. When C is equal to three the shape is like those in the graphs plotted in the previous chapter. Thus, this being the case and the results are not improved with any other value, three is used for C for all other results.

Time Period 1950-66 With Quarterly Data

Tables 3-13 through 3-16 illustrates the significance of the interest rate as a variable when money supply is lagged and/or full employment surplus or deficit is lagged. Interest rate is not used as a lagged variable.

In only one case, in Table 3-14, equation 1, is the interest rate co-efficient statistically significant at the five percent level. In two more cases (Table 3-14, equation 3 and Table 3-16, equation 1) the interest rate co-efficient is significant at the 10 percent level. The above three cases are all in constant prices. With current prices, the interest rate co-efficient is not significant. Also, with current prices the sign is not consistant. One will recall that the results for interest rate obtained with stepwise multiple regression are somewhat better.

The explanation for the difference in results is difficult to explain. But since a change in sign occurs only in current prices, the explanation may lie with the influence of inflation on the variable. Other than the above three cases, interest rate does not influence the regression equation, and therefore, the results of this section to any great degree.

The real problem is to determine what number of lag periods to use. That is, to determine the value of B in the parenthesis (A B C).

EQUATIONS FOR TABLES 3-13 AND 3-14

1. $Y = a + b_1X_1 + b_2X_2 + b_3X_3$ (3 2 3)
2. $Y = a + b_2X_2 + b_3X_3$ (3 2 3)
3. $Y = a + b_1X_1 + b_2X_2 + b_3X_3$ (4 3 3)
4. $Y = a + b_2X_2 + b_3X_3$ (4 3 3)
5. $Y = a + b_1X_1 + b_2X_2 + b_3X_3$ (5 4 3)
6. $Y = a + b_2X_2 + b_3X_3$ (5 4 3)
7. $Y = a + b_1X_1 + b_2X_2 + b_3X_3$ (6 5 3)
8. $Y = a + b_2X_2 + b_3X_3$ (6 5 3)

Where Y = stock prices

a = intercept

X_1 = interest rate

X_2 = full-employment surplus or deficit

X_3 = money supply

TABLE 3-13

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR ALL VARIABLES IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_3	Full-Employment Surplus or Deficit X_2	Interest Rate X_1	T - Value X_3	T - Value X_2	T - Value X_1	Standard Error of Regression Coefficient X_3	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_1
1	.94	9.45	.51	-92.45	.0317	.0114	.4129	18.65	1.55	.28	.0017	.0073	1.4757
2	.94	9.38	.50	-93.16	.0321	.0113	-	29.18	1.55	-	.0011	.0073	-
3	.94	9.08	.43	-94.98	.0329	.0074	-.4517	19.35	1.01	-.31	.0017	.0074	1.4553
4	.94	9.01	.44	-94.16	.0325	.0077	-	29.54	1.06	-	.0011	.0072	-
5	.94	8.88	.37	-96.29	.0336	.0117	-.9257	18.67	1.56	-.64	.0018	.0075	1.4402
6	.94	8.83	.39	-94.55	.0327	.0120	-	29.73	1.62	-	.0011	.0074	-
7	.94	8.93	.39	-95.14	.0334	.0133	-.8196	18.56	1.73	-.56	.0018	.0077	1.7341
8	.94	8.87	.42	-93.58	.0326	.0137	-	27.17	1.80	-	.0012	.0076	-

TABLE 3-14

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR ALL VARIABLES IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_3	Full-Employment Surplus or Deficit X_2	Interest Rate X_1	T - Value X_3	T - Value X_2	T - Value X_1	Standard Error of Regression Coefficient X_3	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_1
1	.80	13.25	.43	-145.68	.0377	-.0074	4.3535	11.09	-.74	2.28	.0034	.0100	1.9088
2	.79	13.68	.38	-157.78	.0423	-.0107	-	15.11	-1.05	-	.0028	.0102	-
3	.83	12.20	.37	-158.03	.0410	-.0160	2.5243	12.42	-1.54	1.37	.0033	.0104	1.8379
4	.83	12.29	.35	-166.25	.0439	-.0132	-	16.88	-1.89	-	.0026	.0102	-
5	.85	11.61	.34	-160.46	.0421	-.0102	1.7134	12.76	-1.01	.97	.0033	.0101	1.7741
6	.84	11.60	.32	-166.20	.0441	-.0119	-	17.64	-1.21	-	.0025	.0099	-
7	.87	10.87	.39	-159.46	.0421	-.0034	1.5229	13.58	- .34	.92	.0031	.0100	1.6617
8	.86	10.85	.34	-164.54	.0439	-.0049	-	18.29	- .50	-	.0024	.0098	-

EQUATIONS FOR TABLES 3-15 AND 3-16

1. $Y = a + b_1X_1 + b_2X_2$ (4 3 3) $+ b_3X_3$ (4 3 3)
2. $Y = a + b_2X_2$ (4 3 3) $+ b_3X_3$ (4 3 3)
3. $Y = a + b_1X_1 + b_2X_2$ (5 4 3) $+ b_3X_3$ (5 4 3)
4. $Y = a + b_2X_2$ (5 4 3) $+ b_3X_3$ (5 4 3)
5. $Y = a + b_1X_1 + b_2X_2$ (6 5 3) $+ b_3X_3$ (6 5 3)
6. $Y = a + b_2X_2$ (6 5 3) $+ b_3X_3$ (6 5 3)

Where Y = stock prices

a = intercept

X_1 = interest rate

X_2 = full-employment surplus or deficit

X_3 = money supply

TABLE 3-15

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR ALL VARIABLES IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_3	Full-Employment Surplus or Deficit X_2	Interest Rate X_1	T - Value			Standard Error of Regression Coefficient		
								X_3	X_2	X_1	X_3	X_2	X_1
1	.94	9.02	.35	-94.32	.0325	.0153	-.0768	18.06	1.53	-.05	.0018	.0100	1.4640
2	.94	8.95	.35	-94.18	.0325	.0154	-	29.54	1.57	-	.0011	.0098	-
3	.94	8.96	.34	-94.88	.0331	.0161	-.5127	18.39	1.48	-.34	.0018	.0109	1.5135
4	.94	8.89	.34	-93.95	.0326	.0170	-	29.64	1.62	-	.0011	.0105	-
5	.95	8.91	.35	-93.82	.0327	.0210	-.0277	17.21	1.91	-.02	.0019	.0115	1.5372
6	.95	8.82	.36	-93.77	.0327	.0210	-	27.25	1.91	-	.0012	.0110	-

TABLE 3-16

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR ALL VARIABLES IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950 - 66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_3	Full-Employment Surplus or Deficit X_2	Interest Rate X_1	T - Value X_3	T - Value X_2	T - Value X_1	Standard Error of Regression Coefficient X_3	Standard Error of Regression Coefficient X_2	Standard Error of Regression Coefficient X_1
1	.83	12.37	.35	-156.67	.0408	-.0195	2.5185	12.00	-1.37	1.32	.0034	.0142	1.9075
2	.83	12.45	.33	-164.94	.0437	-.0249	-	16.15	-1.82	-	.0027	.0137	-
3	.85	11.71	.33	-161.33	.0424	-.0192	1.4530	12.11	-1.20	.75	.0035	.0160	1.9327
4	.85	11.67	.30	-166.17	.0441	-.0238	-	16.96	-1.62	-	.0026	.0147	-
5	.88	10.77	.38	-162.98	.0426	-.0070	1.8988	12.91	- .43	1.06	.0033	.0162	1.7953
6	.88	10.78	.31	-168.61	.0447	-.0136	-	17.19	- .91	-	.0026	.0150	-

As mentioned earlier, the effects of fiscal action on stock prices are seen earlier than monetary action. This being the case, one would expect the best results with full-employment surplus or deficit lagged one, two, or three quarters[11] and money supply lagged three, four or five quarters. This, however, is not the case. In current prices, with each additional lag the sum of the co-efficients for full-employment surplus or deficit (alone in the equation) get larger and with an 11 quarters lag it becomes statistically significant at the five percent level. The R^2 values increase from .00 to .46 with an 11 quarter lag and further to .77 with a 15 quarter lag[12] (See Table 3-17).

The sign of the individual co-efficients do not remain consistent after the second quarter lag. However, the sum of the co-efficients for all quarters remain negative, which is expected. Results with constant prices are similar (See Table 3-18) except that the co-efficients are larger and become statistically significant at the five percent level with a nine quarter lag instead of an 11 quarter lag.

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[11]When lagged one quarter, the results are the same as obtained with no lags at all.

[12]This was also found to be the case when regressing high-employment budget surplus against GNP. L. C. Anderson, and J. L. Jordon, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization", Federal Reserve Bank of St. Louis Review (November 1968), pp. 11 - 24.

It was also found that fiscal policy had long run affects on employment and output. L. C. Anderson, "A Monetariest View of Demand Management: The United States Experience", Federal Reserve Bank of St. Louis Review (September 1971), p. 4.

EQUATIONS FOR TABLES 3-17 AND 3-18

1. $Y = a + b_1X_1$ (3 2 3
2. $Y = a + b_1X_1$ (4 3 3)
3. $Y = a + b_1X_1$ (5 4 3)
4. $Y = a + b_1X_1$ (6 5 3)
5. $Y = a + b_1X_1$ (6 6 3)
6. $Y = a + b_1X_1$ (6 7 3)
7. $Y = a + b_1X_1$ (6 8 3)
8. $Y = a + b_1X_1$ (6 9 3)
9. $Y = a + b_1X_1$ (6 10 3)
10. $Y = a + b_1X_1$ (6 11 3)
11. $Y = a + b_1X_1$ (6 12 3)
12. $Y = a + b_1X_1$ (6 13 3)
13. $Y = a + b_1X_1$ (6 14 3)
14. $Y = a + b_1X_1$ (6 15 3)

Where Y = stock prices

a = intercept

X_1 = full-employment surplus or deficit

TABLE 3-17

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Full-Employment Surplus or Deficit X_1	T - Value X_1	Standard Error of Regression Coefficient X_1
1	.00	36.68	.03	84.13	-.0037	-.10	.0365
2	.01	36.45	.02	85.02	-.0060	-.16	.0387
3	.03	35.92	.05	85.70	-.0145	-.35	.0415
4	.11	34.40	.09	86.33	-.0212	-.51	.0412
5	.17	33.14	.12	86.92	-.0273	-.63	.0434
6	.23	31.76	.09	87.89	-.0280	-.64	.0438
7	.27	30.77	.13	88.49	-.0341	-.71	.0478
8	.34	29.27	.16	89.25	-.0380	-.80	.0473
9	.38	28.17	.24	88.95	-.0636	-1.34	.0474
10	.46	26.12	.18	88.86	-.0879	-1.95	.0460
11	.54	24.10	.37	88.04	-.1250	-2.72	.0460
12	.66	20.67	.37	87.63	-.1501	-3.69	.0407
13	.71	18.75	.44	87.34	-.1720	-4.46	.0386
14	.77	16.73	.25	88.12	-.1804	-4.97	.0361

TABLE 3-18

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Full-Employment Surplus or Deficit X_1	T - Value X_1	Standard Error of Regression Coefficient X_1
1	.01	29.33	.05	84.72	-.0216	- .79	.0274
2	.02	28.99	.04	85.44	-.0263	- .91	.0290
3	.05	28.45	.07	86.03	-.0330	-1.07	.0309
4	.13	27.24	.11	86.74	-.0349	-1.14	.0307
5	.18	26.28	.13	87.30	-.0374	-1.14	.0328
6	.24	25.10	.10	88.18	-.0365	-1.09	.0334
7	.28	24.35	.14	88.64	-.0417	-1.13	.0369
8	.35	23.12	.20	89.26	-.0444	-1.20	.0367
9	.40	22.18	.28	89.06	-.0638	-1.75	.0364
10	.49	20.28	.22	89.17	-.0811	-2.33	.0348
11	.57	18.64	.40	88.78	-.1054	-3.03	.0345
12	.68	15.87	.40	88.75	-.1208	-3.99	.0303
13	.73	14.44	.47	88.61	-.1356	-4.69	.0289
14	.78	12.85	.28	89.33	-.1408	-5.22	.0270

A possible reason why this type of result is obtained is that the measure used for fiscal policy, full-employment surplus or deficit, may not be a reliable measure.[13] Another possible reason is the omission of expectations from the equation. Michael W. Keran used expectations as a variable in his study[14] and found it to be a statistically significant influence on stock prices.

Money supply, on the other hand, follows the pattern consistent with theory when data is in current prices. It reaches its major influence by the third quarter and remains fairly constant for three years (See Table 3-19). In their study, Andersen and Jordon found that in their equation, a marked and sustained change in monetary growth has its major effect on nominal GNP within five quarters.[15] From the results of this study, monetary policy has its major effect on stock prices within three quarters. This puts stock prices in a lead position over economic activity as was mentioned earlier.

The above is not true while using constant prices. An examination of Table 3-20 shows that monetary actions do not have their major effect on stock price until the seventh quarter. This implies that

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[13]This was also suggested to be the case by L. C. Andersen and J. L. Jordon, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization", Federal Reserve Bank of St. Louis Review (November 1968), p. 18.

[14]M. W. Kerans, "Expectations, Money and the Stock Market", Federal Reserve Bank of St. Louis Review (January 1971), pp. 16 - 31.

[15]L. C. Andersen and J. L. Jordon, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization", Federal Reserve Bank of St. Louis Review (November 1968), pp. 11 - 24.

EQUATIONS FOR TABLES 3-19 AND 3-20

1. $Y = a + b_1X_1$ (3 2 3)
2. $Y = a + b_1X_1$ (4 3 3)
3. $Y = a + b_1X_1$ (5 4 3)
4. $Y = a + b_1X_1$ (6 5 3)
5. $Y = a + b_1X_1$ (6 6 3)
6. $Y = a + b_1X_1$ (6 7 3)
7. $Y = a + b_1X_1$ (6 8 3)
8. $Y = a + b_1X_1$ (6 9 3)
9. $Y = a + b_1X_1$ (6 10 3)
10. $Y = a + b_1X_1$ (6 11 3)
11. $Y = a + b_1X_1$ (6 12 3)
12. $Y = a + b_1X_1$ (6 13 3)
13. $Y = a + b_1X_1$ (6 14 3)
14. $Y = a + b_1X_1$ (6 15 3)

Where Y = stock prices

a = intercept

X_1 = money supply

TABLE 3-19

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY
IN QUARTERLY CURRENT PRICES FOR THE PERIOD
1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	T - Value X_1	Standard Error of Regression Coefficient X_1
1	.93	9.48	.50	-92.92	.0320	29.09	.0011
2	.94	9.02	.40	-94.39	.0325	29.54	.0011
3	.94	8.95	.35	-94.84	.0328	29.82	.0011
4	.94	9.04	.35	-94.49	.0328	27.33	.0012
5	.94	9.09	.35	-94.18	.0327	25.15	.0013
6	.94	9.15	.35	-93.47	.0326	23.29	.0014
7	.94	9.16	.36	-91.39	.0321	21.40	.0015
8	.93	9.20	.35	-88.53	.0313	18.41	.0017
9	.93	9.33	.36	-88.61	.0314	16.53	.0019
10	.93	9.33	.35	-90.67	.0320	16.00	.0020
11	.93	9.50	.34	-91.72	.0323	14.04	.0023
12	.93	9.54	.34	-88.74	.0316	11.70	.0027
13	.92	9.59	.37	-85.55	.0309	9.36	.0033
14	.92	9.50	.42	-76.35	.0286	7.33	.0039

TABLE 3-20

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY
IN QUARTERLY CONSTANT PRICES FOR THE PERIOD
1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	T - Value X_1	Standard Error of Regression Coefficient X_1
1	.78	13.70	.31	-157.48	.0423	15.11	.0028
2	.82	12.54	.28	-162.63	.0433	16.65	.0026
3	.84	11.65	.27	-164.28	.0438	17.52	.0025
4	.86	10.78	.34	-163.32	.0437	18.21	.0024
5	.88	10.10	.35	-164.16	.0440	19.13	.0023
6	.89	9.67	.34	-163.03	.0439	19.09	.0023
7	.89	9.44	.35	-159.45	.0433	18.04	.0024
8	.89	9.30	.33	-153.92	.0423	17.62	.0024
9	.89	9.34	.35	-152.58	.0421	16.19	.0026
10	.89	9.37	.34	-153.82	.0424	15.70	.0027
11	.89	9.46	.36	-149.95	.0417	14.38	.0029
12	.89	9.23	.36	-139.73	.0398	12.84	.0031
13	.89	9.03	.42	-128.46	.0377	11.09	.0034
14	.90	8.67	.54	-118.35	.0359	9.97	.0036

inflation affects the results.

The sign of the individual co-efficients are all positive up until seven lags. After this the sign of the individual co-efficients is not consistent but the sum of the co-efficients remain positive, as is expected.

When full-employment surplus or deficit and money supply both are lagged together in current prices the results are altered (See Table 3-21). The major difference is that the sum of the co-efficients for full-employment surplus or deficit is larger than before and is positive. This is opposite to the expected sign but is consistent with the earlier results in the study. It is significant at the five percent level, except for equation 2, up to nine quarter lags. However this equation is significant at the 10 percent level. After the 10 quarter lag period the sum of the co-efficient starts to decrease in size and is no longer significant. And at the 12 quarter lag period the sign becomes negative. Again there is no theoretical justification for this type of result, except the possibilities already mentioned above.

The results are also altered when using constant prices. The sign of the sum of the co-efficient for full-employment surplus or deficit is not consistent. It is significant at the five percent level for only three equations (See Table 3-22).

It is easily seen that when full-employment surplus or deficit is alone in the regression equation, the best results are obtained for equations in constant prices. This is just opposite to that for money supply. These results imply that inflation affects fiscal actions in a negative manner and monetary actions in a positive manner. Also, that

EQUATIONS FOR TABLES 3-21 AND 3-22

1. $Y = a + b_1X_1\ (3\ 2\ 3) + b_2X_2\ (3\ 2\ 3)$
2. $Y = a + b_1X_1\ (4\ 3\ 3) + b_2X_2\ (4\ 3\ 3)$
3. $Y = a + b_1X_1\ (5\ 4\ 3) + b_2X_2\ (5\ 4\ 3)$
4. $Y = a + b_1X_1\ (6\ 5\ 3) + b_2X_2\ (6\ 5\ 3)$
5. $Y = a + b_1X_1\ (6\ 6\ 3) + b_2X_2\ (6\ 6\ 3)$
6. $Y = a + b_1X_1\ (6\ 7\ 3) + b_2X_2\ (6\ 7\ 3)$
7. $Y = a + b_1X_1\ (6\ 8\ 3) + b_2X_2\ (6\ 8\ 3)$
8. $Y = a + b_1X_1\ (6\ 9\ 3) + b_2X_2\ (6\ 9\ 3)$
9. $Y = a + b_1X_1\ (6\ 10\ 3) + b_2X_2\ (6\ 10\ 3)$
10. $Y = a + b_1X_1\ (6\ 11\ 3) + b_2X_2\ (6\ 11\ 3)$
11. $Y = a + b_1X_1\ (6\ 12\ 3) + b_2X_2\ (6\ 12\ 3)$
12. $Y = a + b_1X_1\ (6\ 13\ 3) + b_2X_2\ (6\ 13\ 3)$
13. $Y = a + b_1X_1\ (6\ 14\ 3) + b_2X_2\ (6\ 14\ 3)$
14. $Y = a + b_1X_1\ (6\ 15\ 3) + b_2X_2\ (6\ 15\ 3)$

Where Y = stock prices

a = intercept

X_1 = money supply

X_2 = full-employment surplus or deficit

TABLE 3-21

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN OUARTERLY CURRENT PRICES FOR THE PERIOD 1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus Deficit X_2	T - Value X_1	T - Value X_2	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2
1	.94	9.25	.42	-93.68	.0322	.0214	29.27	2.28	.0011	.0094
2	.94	8.95	.35	-94.18	.0325	.0154	29.54	1.57	.0011	.0098
3	.94	8.89	.34	-93.95	.0326	.0170	29.64	1.62	.0011	.0105
4	.95	8.82	.36	-93.77	.0327	.0210	27.25	1.91	.0012	.0110
5	.95	8.76	.36	-94.25	.0329	.0290	23.50	2.40	.0014	.012I
6	.95	8.66	.39	-88.66	.0317	.0289	21.13	2.32	.0015	.0125
7	.95	8.79	.44	-86.19	.0311	.0302	18.29	2.16	.0017	.0140
8	.95	8.64	.50	-78.75	.0295	.0257	15.53	1.80	.0019	.0143
9	.95	8.34	.66	-75.75	.0292	.0196	14.60	1.33	.0020	.0147
10	.97	6.60	.86	-62.03	.0264	.0055	15.53	.45	.0017	.0122
11	.98	5.49	.96	-55.58	.0255	-.0024	15.00	- .20	.0017	.0115
12	.98	5.23	1.06	-45.20	.0234	-.0147	12.32	-1.26	.0019	.0117
13	.98	5.37	.94	-52.61	.0258	-.0117	9.92	- .87	.0026	.0135
14	.97	5.84	.74	-47.19	.0249	-.0252	7.78	-1.60	.0032	.0157

TABLE 3-22

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-66

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	T - Value X_1	T - Value X_2	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2
1	.79	13.79	.38	-157.70	.0423	-.0115	15.10	- .85	.0028	.0135
2	.83	12.45	.33	-164.94	.0437	-.0249	16.15	-1.82	.0027	.0137
3	.85	11.67	.30	-166.17	.0441	-.0238	16.96	-1.62	.0026	.0147
4	.88	10.78	.31	-168.61	.0447	-.0136	17.19	- .91	.0026	.0150
5	.89	10.23	.28	-168.12	.0447	-.0031	17.19	- .20	.0026	.0158
6	.90	9.73	.32	-157.74	.0430	.0077	15.93	.48	.0027	.0162
7	.90	9.60	.38	-151.42	.0419	.0133	14.96	.77	.0028	.0173
8	.91	9.19	.45	-138.08	.0395	.0231	14.11	1.28	.0028	.0181
9	.91	8.82	.64	-129.63	.0380	.0197	13.57	1.03	.0028	.0191
10	.95	6.79	.85	-110.80	.0347	.0151	15.09	.97	.0023	.0155
11	.96	5.58	.83	- 98.32	.0325	.0009	15.48	.07	.0021	.0135
12	.97	5.20	.91	- 85.64	.0304	-.0094	14.48	- .67	.0021	.0140
13	.96	5.55	.94	- 81.93	.0299	-.0214	12.46	-1.28	.0024	.0167
14	.96	5.88	.76	- 71.46	.0281	-.0345	10.41	-1.82	.0027	.0190

monetary actions exert a larger influence on stock prices than do fiscal action.

Keran explains the effect of inflation in these words:

> The difference arises from the confusion between expected inflation and actual inflation. When inflation occurs, but is not expected to continue, there may be some increase in observed earnings of corporations, which would tend to raise earnings expectations and the stock price. However, when inflation is expected to continue, real earnings expectations are apparently not significantly influenced.[16]

Since inflation was particularly high in the late sixties, this could be the explanation for the slight improvement in results when the time period is extended to 1970.

Time Period 1950-70 With Quarterly Data

By extending the time period in current prices for four years, the overall results are improved slightly. A comparison of Tables 3-21 and 3-22 to Tables 3-23 and 3-24 illustrates this. In current prices the sign of the sum of the full-employment surplus or deficit coefficient is negative in all cases, where before it was positive. However, none are significant at the five percent level until the 11 quarter lag period.

The R^2 values are increased from .93 to .96 and the standard error of estimate increases from 9.25 to 10.13, when all variables are in the equation. Although the standard error of estimate increases slightly instead of decreasing, the increase in R^2 far offsets the

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[16] M. W. Keran, "Expectations, Money and the Stock Market", Federal Reserve Bank of St. Louis Review (January 1971), p. 25.

EQUATIONS FOR TABLES 3-23 AND 3-24

1. $Y = a + b_1X_1\ (3\ 2\ 3) + b_2X_2\ (3\ 2\ 3)$
2. $Y = a + b_1X_1\ (4\ 3\ 3) + b_2X_2\ (4\ 3\ 3)$
3. $Y = a + b_1X_1\ (5\ 4\ 3) + b_2X_2\ (5\ 4\ 3)$
4. $Y = a + b_1X_1\ (6\ 5\ 3) + b_2X_2\ (6\ 5\ 3)$
5. $Y = a + b_1X_1\ (6\ 6\ 3) + b_2X_2\ (6\ 6\ 3)$
6. $Y = a + b_1X_1\ (6\ 7\ 3) + b_2X_2\ (6\ 7\ 3)$
7. $Y = a + b_1X_1\ (6\ 8\ 3) + b_2X_2\ (6\ 8\ 3)$
8. $Y = a + b_1X_1\ (6\ 9\ 3) + b_2X_2\ (6\ 9\ 3)$
9. $Y = a + b_1X_1\ (6\ 10\ 3) + b_2X_2\ (6\ 10\ 3)$
10. $Y = a + b_1X_1\ (6\ 11\ 3) + b_2X_2\ (6\ 11\ 3)$
11. $Y = a + b_1X_1\ (6\ 12\ 3) + b_2X_2\ (6\ 12\ 3)$
12. $Y = a + b_1X_1\ (6\ 13\ 3) + b_2X_2\ (6\ 13\ 3)$
13. $Y = a + b_1X_1\ (6\ 14\ 3) + b_2X_2\ (6\ 14\ 3)$
14. $Y = a + b_1X_1\ (6\ 15\ 3) + b_2X_2\ (6\ 15\ 3)$

Where Y = stock prices

a = intercept

X_1 = money supply

X_2 = full-employment surplus or deficit

TABLE 3-23

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950-70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply Of Money X_1	Full-Employment Surplus or Deficit X_2	T - Value X_1	T - Value X_2	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2
1	.96	10.13	.46	-77.63	.0290	-.0006	36.25	- .09	.0008	.0068
2	.97	9.93	.40	-78.58	.0293	-.0054	32.56	- .75	.0009	.0072
3	.97	9.99	.42	-77.28	.0291	-.0052	32.33	- .66	.0009	.0077
4	.97	9.83	.47	-74.18	.0286	-.0043	28.60	- .55	.0010	.0078
5	.97	9.71	.53	-72.63	.0285	-.0050	25.91	- .60	.0011	.0083
6	.97	9.30	.49	-70.18	.0280	-.0077	25.45	- .93	.0011	.0083
7	.97	9.30	.50	-69.02	.0278	-.0089	23.17	- .98	.0012	.0091
8	.97	9.34	.58	-65.60	.0270	-.0101	19.28	-1.05	.0014	.0096
9	.97	9.10	.73	-63.55	.0266	-.0162	16.62	-1.64	.0016	.0099
10	.98	8.17	.71	-61.43	.0263	-.0240	16.44	-2.61	.0016	.0092

TABLE 3-24

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CONSTANT PRICES FOR THE PERIOD 1950-70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	T - Value X_1	T - Value X_2	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2
1	.88	12.72	.38	-151.91	.0412	-.0083	21.68	- .91	.0019	.0091
2	.90	11.70	.33	-157.50	.0424	-.0174	22.32	-1.85	.0019	.0094
3	.91	11.06	.33	-155.42	.0421	-.0172	22.16	-1.77	.0019	.0097
4	.92	10.35	.40	-150.40	.0413	-.0136	21.74	-1.42	.0019	.0096
5	.93	9.86	.43	-146.00	.0407	-.0121	20.35	--1.22	.0020	.0099
6	.94	9.34	.41	-138.78	.0395	-.0112	19.75	-1.13	.0020	.0099
7	.94	9.20	.43	-135.17	.0389	-.0117	18.52	-1.11	.0021	.0105
8	.94	9.11	.51	-126.88	.0375	-.0086	16.30	- .75	.0023	.0114
9	.94	8.81	.67	-120.07	.0363	-.0125	15.78	-1.04	.0023	.0120
10	.96	7.68	.67	-111.15	.0348	-.0167	15.82	-1.40	.0022	.0112

decrease in the standard error of estimate.

Other than these minor changes the results are similar for both time periods. Also, the results are similar when using constant prices.

The problems of autocorrelation and multicollinearity are similar to those descussed with the stepwise multiple regression procedure. The problems of autocorrelation will be directly related to the "money supply equation" in the next section of this chapter, which is used to test the predictive power of the equations developed.

Analysis of the Predictive Powers

It appears that stock prices are strongly influenced by monetary actions and that fiscal actions do not influence stock prices to any great degree.[17]

Equation 3 from Tables 3-19 and 3-20 is chosen to test the predictive power of the model when money supply is the only independent variable.

Money Supply Equation in Current Prices[18]

Sample Period: 1950-66

Summary Results:

$$Y_t = -94.84 + \sum_{i=o}^{3} .0328\ M_{t-i}$$

(-15.57) (29.82)

$R^2 = .94$
S.E. = 8.95
D-W = .35

---

[17]This is true when full-employment surplus or deficit is used as the measure for fiscal policy. If a different measure were used; for example, public spending, the results may be different.

[18]Note: t statistics appear with each regression co-efficient, enclosed by parentheses. A co-efficient is considered statistically significant at the five percent level if accompanying t statistic is higher than 1.67. R^2 is the co-efficient of determination, S.E. is the standard error of estimate, and D-W is the Durbin-Watson Statistic.

Detailed Results:

	M_o	= .0020	(.30)
	M_1	= .0118	(1.29)
	M_2	= .0087	(.94)
	M_3	= .0103	(1.47)
$\sum_{i=o}^{3}$	M_i	= .0328	(29.82)

Money Supply Equation in Constant Prices [19]

Sample Period: 1950-66

Summary Results:

$$i/t = -164.28 + \sum_{i=o}^{3} .0438\ M_{t-i}$$

R^2 = .84
S.E.=11.65
D-W = .27

Detailed Results:

	M_o	= .0135	(.008)
	M_1	= .0104	(.010)
	M_2	= .0088	(.010)
	M_3	= .0111	(.008)
$\sum_{i=o}^{3}$	M_i	= .0438	(17.52)

In current prices the "money supply equation" explains 94 percent of the variation in the stock price index. Although by themselves the individual co-efficients are not statistically significant, the sum of the co-efficient is statistically significant and has the expected sign.

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[19] Ibid.

The standard error of estimate is only 8.95. This means that 68 percent of the times (one standard deviation below or above the mean), the estimated value of the stock price is within 8.95 points of the regression line.

The weakness of the above equation is the low Durbin-Watson statistic which implies that the predicted value of the stock price is systematically above the actual values. In other words, it indicates the existence of autocorrelation and one can see that the predicted values in Table 3-25 are systematically above the actual stock prices. This means that the standard errors of regression co-efficients are understated.

TABLE 3-25

PREDICTED VALUES FOR THE MONEY SUPPLY EQUATION

		Current		Current	
		Actual	Predicted	Actual	Predicted
1970	4th	192.5	225.4	143.1	157.8
	3rd	181.3	229.4	135.0	162.0
	2nd	189.7	228.0	142.4	167.7
	1st	213.7	218.7	161.4	165.8
1969	4th	207.6	216.0	158.6	163.6
	3rd	194.7	204.6	151.2	159.0
	2nd	207.3	198.8	161.8	153.6
	1st	200.2	194.5	159.0	153.8
1968	4th	193.0	186.0	154.5	149.0
	3rd	179.6	190.9	146.4	149.3
	2nd	169.3	188.3	139.1	154.3
	1st	163.1	187.4	134.7	153.8
1967	4th	169.7	184.3	142.5	154.2
	3rd	172.6	175.6	144.8	149.0
	2nd	164.5	168.5	139.4	143.0
	1st	157.6	161.5	134.5	138.7

It has already been pointed out that the results of the study indicate that fiscal actions do not influence stock prices significantly in the short run, i.e. within one or two quarters. However, with about a two and a half year lag fiscal actions do have a significant influence. A comparison of Tables 3-19 and 3-21 illustrate this point, as well as other tables mentioned earler. The R^2 values are not changed to any great degree by adding full-employment surplus or deficit until the 11 quarter lag. It is at this point that the sum of the full-employment surplus or deficit co-efficient becomes statistically significant, at the five percent level. Thus, since the best results are obtained with money supply being lagged three or four quarters, full-employment surplus or deficit can be excluded from the model.

Predictions were made with full-employment surplus or deficit and interest rate in the model. The results were not as good as those contained in Table 3-25. Thus, from the equations developed, money supply alone provides the best means of predicting the movements in stock prices.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

This study was conducted to determine the influence of monetary and fiscal actions on stock prices. Money supply and interest rate were used as a measure of monetary policy and full-employment surplus or deficit as the measure of fiscal policy.

Multiple regression was used to determine the influence of money supply and interest rate, and full-employment surplus or deficit on stock prices. Almon distribution lag and stepwise techniques were used in the study. Seven equations were developed using the stepwise multiple regression technique. All seven equations were used both in current and constant prices for both the periods 1950-66 and 1950-70. Another six equations were developed for the Almon distribution lag technique. This technique allowed one to determine the distributed lag of money supply and full-employment surplus or deficit.

Both quarterly and annual data were used in the study. Quarterly data was used for all 13 equations developed. Annual data, however, was used only in the first seven equations using the stepwise multiple regression technique.

An equation developed using the Almon distribution lag technique with only money supply in it was termed the "money supply equation". This equation was analyzed in detail. Predictions were made with this equation in both current and constant prices to test the predictive powers of the model.

Conclusions

The results of this study showed that monetary policy had a predominant influence on stock prices in Canada. The response of stock prices to money supply relative to full-employment surplus or deficit was stronger, more predictable and operated more quickly.

The use of current prices in stepwise multiple regression resulted in a higher R^2 and a lower standard error of estimate for money supply. This held true for all equations in which money supply was included. With interest rate by itself or with full-employment surplus or deficit the results were best in current prices. However, when combined with money supply the interest rate co-efficient was not statistically significant. In constant prices it was significant in all cases. These results implied that inflation had an effect on the variables.

With the use of the Almon distribution lag technique it was found that money supply had its major influence on stock prices by the end of three quarters. By increasing the lag beyond five quarters there was only a slight change in the total influence.

Full-employment surplus or deficit on the other hand did not even become statistically significant until the 11 quarter lag. After about a four year lag, R^2 value began to level off and no great change was seen in the results after this point in time when the data is in current prices.

The results were improved using constant prices. The sum of the co-efficient for full-employment surplus or deficit was significant at the 10 quarter lag. As was the case with interest rate, inflation had a negative effect on full-employment surplus or deficit.

The response of stock prices to fiscal actions relative to monetary actions was smaller, less predictable and much slower. Overall, the results dealing with fiscal actions were inconsistent, theoretically unjustifiable, and statistically insignificant. Thus one might state that either the measure of fiscal actions used does not correctly indicate the degree and direction of such influence or there was no measurable net fiscal influence on stock prices in the test periods.

Inflation seemed to influence the variables. Besides the effects already mentioned above, when the time period is extended from 1950-66 to 1950-70, the overall results are improved. The addition of four years, in which inflation was strong, improved the R^2 value. R^2 increases from 92 to 96 percent and 58 to 79 percent. Thus, overall the influence of inflation in the equation helped to account for more of the variation in stock prices.

The predictions by the "money supply equation" were better than by using other equations which included interest rate and full-employment surplus or deficit. However, the closeness of the predicted values to the actual values was not as good as one would have hoped for. This may be due to the presence of autocorrelation.

The results with annual data in stepwise multiple regression were similar to those using quarterly data except for three things; (1) the co-efficients are smaller, (2) R^2 is increased by as much as eight percent, and (3) with current prices autocorrelation is not present.

The results of this study suggest that money supply alone is a good indicator as to the movement in stock prices. A proposition for further study would be, money supply alone is a good indicator as to the movement in stock prices.

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APPENDIX A

ORIGINAL DATA

TABLE A-1

STOCK PRICE AVERAGE IN CONSTANT PRICES FOR THE TIME PERIOD 1950-70

YEAR		I	II	III	IV	ANNUAL
1970	[1]	161.4	142.4	135.0	143.1	145.5
1969	[2]	206.7	210.4	196.6	206.2	205.0
1968		175.1	180.8	190.3	200.9	186.8
1967		174.9	181.2	188.3	185.2	182.4
1966		185.3	180.1	167.2	158.4	172.7
1965		182.8	186.1	176.0	181.6	181.6
1964		147.3	162.1	169.3	175.5	163.6
1963		129.3	137.2	133.2	137.8	134.4
1962		137.3	127.5	117.4	119.7	125.5
1961		117.4	130.3	137.1	135.0	130.0
1960	[3]	258.3	257.5	253.1	257.5	256.6
1959		277.6	272.5	276.6	262.0	272.2
1958		224.9	235.2	260.0	270.3	247.6
1957		281.4	300.8	275.6	226.1	271.0
1956		265.1	284.0	300.8	280.8	282.7
1955		216.1	231.4	257.0	253.7	239.6
1954		161.6	178.7	187.0	201.8	182.3
1953		171.7	158.4	158.1	152.3	160.1
1952		184.8	175.9	177.6	168.0	176.6
1951		162.6	167.3	175.2	183.0	172.0
1950		112.7	123.6	130.6	143.6	127.6

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[1] The base year for 1970 is 1961 = 100.

[2] The base year for 1969-1961 is 1956 = 100.

[3] The base year for 1960 - 1950 is 1935-39 = 100.

Source: Dominion Bureau of Statistics, Canadian Statistical Review, 11-003, December issues were used (November issues were used in cases where December was not available) and the May issue of 1971 was used for 1970 data.

TABLE A-2

STOCK PRICE AVERAGE IN CONSTANT (1961 = 100)
PRICES FOR THE TIME PERIOD 1960-70

YEAR	I	II	III	IV	ANNUAL
1970	161.4	142.4	135.0	143.1	145.5
1969	159.0	161.8	151.2	158.6	157.7
1968	134.7	139.1	146.4	154.5	143.7
1967	134.5	139.4	144.8	142.5	140.3
1966	142.5	138.5	128.6	121.8	132.8
1965	140.6	143.2	135.4	139.7	139.7
1964	113.3	124.7	130.2	135.0	125.8
1963	99.5	105.5	102.5	106.0	103.4
1962	105.6	98.1	90.3	92.1	96.5
1961	90.3	100.2	105.5	103.8	100.0
1960	79.3	79.1	77.7	79.1	78.8
1959	85.3	83.7	84.9	80.5	83.6
1958	69.1	72.2	79.9	83.0	76.0
1957	86.4	92.4	84.6	69.4	83.2
1956	81.4	87.2	92.4	86.2	86.8
1955	66.4	71.1	78.9	77.9	73.6
1954	49.6	54.9	57.4	62.0	56.0
1953	52.7	48.6	47.6	46.8	49.2
1952	56.8	54.0	54.5	51.6	54.2
1951	49.9	51.4	53.8	56.2	52.8
1950	34.6	38.0	40.1	44.1	39.2

Source: 11-003 Canadian Statistical Review.
December issues mostly (when December was not available November was used). May 1971 issue was used for 1970 data.

Original data was as follows: 1947-60 Base year 1935-39 = 100.
1961-69 Base year 1956 = 100.
1970 Base year 1961 = 100.

D.B.S. conversion method A was used to change all figures to 1961 = 100.

$$1956 \quad \text{Factor} = .76923 \quad \frac{(100)}{(130)}$$

$$1935\text{-}39 \quad \text{Factor} = .30712 \quad \frac{(100)}{(325.6)}$$

TABLE A-3

STOCK PRICE AVERAGE IN CURRENT PRICES
FOR THE TIME PERIOD 1950-70

YEAR	I	II	III	IV	ANNUAL
1970	213.7	189.7	181.3	192.5	194.4
1969	200.2	207.3	194.7	207.6	202.5
1968	163.1	169.3	179.6	193.0	181.1
1967	157.6	164.5	172.6	169.7	166.1
1966	160.7	158.0	148.7	140.7	152.1
1965	151.3	156.2	149.6	154.5	153.0
1964	117.8	131.4	139.2	144.3	133.1
1963	102.4	108.8	105.7	110.5	106.8
1962	106.3	99.2	91.5	94.3	97.9
1961	90.2	100.1	105.3	104.2	100.0
1960	79.1	78.6	77.2	78.5	78.3
1959	83.6	81.9	83.7	79.2	82.1
1958	65.8	69.7	77.1	79.8	73.0
1957	81.4	87.4	80.9	65.9	78.9
1956	74.7	80.0	86.1	81.5	80.6
1955	59.6	63.2	70.9	70.6	66.1
1954	44.3	48.8	51.2	55.4	50.0
1953	45.6	42.7	42.2	41.1	43.2
1952	58.6	47.8	48.8	45.0	47.6
1951	40.4	43.8	45.8	48.1	44.5
1950	25.4	28.2	30.3	34.5	29.6

Source: Computed from Table A-2 by use of the implicit price index.

TABLE A-4

THE MONEY SUPPLY DEFINED AS M1* FOR THE TIME PERIOD 1950-70 IN CURRENT PRICES (MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	1,738	1,660	1,677	1,727	1,701
1969	1,639	1,627	1,664	1,669	1,650
1968	1,461	1,450	1,487	1,564	1,490
1967	1,591	1,636	1,610	1,533	1,592
1966	1,474	1,481	1,514	1,556	1,506
1965	1,323	1,363	1,421	1,459	1,392
1964	1,241	1,244	1,279	1,289	1,263
1963	1,136	1,150	1,184	1,205	1,169
1962	1,108	1,132	1,141	1,116	1,124
1961	1,019	1,020	1,044	1,077	1,040
1960	983	969	986	1,001	985
1959	966	999	1,006	995	999
1958	891	908	974	1,000	943
1957	864	865	873	878	870
1956	859	863	884	885	873
1955	821	812	843	860	834
1954	904	884	807	814	852
1953	893	871	876	892	883
1952	836	816	823	858	833
1951	749	757	776	847	782
1950	728	720	759	809	754

Source: 11-003 Canadian Statistical Review Dec. issues mostly (when not available Nov. was used). May 1971 issue was used for 1970 data.

Original data was given in monthly figures. These were added by quarters to get quarterly averages.

Note: The Bank Act of 1954 resulted in some changes in the figures. see footnote on pp. 65 of the Dec. 1954 issue.

* Cash reserves.

TABLE A-5

THE MONEY SUPPLY DEFINED AS M3* FOR THE TIME PERIOD 1950-70 IN CURRENT PRICES (MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	28,742	29,128	30,075	31,417	119,362
1969	27,779	28,292	28,462	28,882	113,415
1968	24,307	25,044	26,374	27,272	102,997
1967	21,655	22,416	23,326	24,099	91,496
1966	19,822	20,139	20,632	21,170	81,763
1965	18,039	18,671	19,461	19,814	75,985
1964	16,773	17,052	17,396	17,589	68,810
1963	15,468	15,739	16,091	16,628	63,926
1962	14,981	15,412	15,147	15,298	60,838
1961	13,757	13,856	14,313	14,742	56,668
1960	13,042	13,168	13,248	13,714	53,172
1959	13,197	13,221	13,294	13,122	52,834
1958	11,867	12,189	12,908	13,226	50,190
1957	11,333	11,450	11,473	11,699	45,955
1956	11,265	11,408	11,471	11,505	45,649
1955	10,367	10,760	11,230	11,378	43,435
1954	9,738	9,702	9,961	10,328	39,729
1953	9,268	9,500	9,554	9,698	38,020
1952	8,705	8,862	9,057	9,268	35,892
1951	8,623	8,555	8,558	8,684	34,420
1950	8,184	8,295	8,382	8,669	33,530

Source: Bank of Canada (computer output sent to us January, 1971). IV quarter 1970 taken from 11-003 Canadian Statistical Review April 1971.

* Currency outside banks plus chartered bank deposits (including Government of Canada deposits) less float.

TABLE A-6

THE MONEY SUPPLY DEFINED AS M2* FOR THE TIME PERIOD 1950-70 IN CURRENT PRICES (MILLIONS OF DOLLARS

YEAR	I	II	III	IV	ANNUAL
1970	10,050	9,432	9,554	10,317	39,361
1969	9,269	9,557	9,732	10,093	38,651
1968	8,807	8,441	8,826	9,390	35,464
1967	8,508	8,638	8,685	8,588	34,419
1966	7,707	7,647	7,858	8,336	31,548
1965	7,250	7,265	7,588	7,739	29,842
1964	7,032	7,009	7,155	7,178	28,274
1963	6,318	6,275	6,475	6,965	26,033
1962	6,320	6,421	6,151	6,365	25,257
1961	5,778	5,557	5,788	6,149	23,272
1960	5,541	5,555	5,517	5,917	22,530
1959	5,647	5,488	5,511	5,557	23,103
1958	5,119	5,180	5,575	5,750	21,624
1957	4,836	4,845	4,781	5,046	19,508
1956	5,096	5,083	5,066	5,055	20,300
1955	4,573	4,666	4,964	5,193	19,396
1954	4,605	4,371	4,460	4,747	18,183
1953	4,285	4,398	4,379	4,605	17,667
1952	4,344	4,412	4,561	4,701	18,018
1951	4,401	4,313	4,302	4,409	17,425
1950	4,026	4,089	4,209	4,503	16,827

Source: Bank of Canada (computer output sent to us in January, 1971). IV quarter 1970 taken from 11-003 Canadian Statistics Review April 1971.

* Currency outside banks plus chartered bank deposits (including Government of Canada deposits) less float less personal savings and non-personal term and notice deposits.

TABLE A-7

THE MONEY SUPPLY DEFINED AS M2 FOR THE TIME PERIOD
1950-70 IN CONSTANT (1961 = 100) PRICES
(MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	7,591	7,081	7,114	7,671	29,462
1969	7,362	7,461	7,556	7,710	30,102
1968	7,273	6,936	7,193	7,518	28,927
1967	7,259	7,320	7,286	7,211	29,070
1966	6,832	6,702	6,798	7,217	27,553
1965	6,738	6,659	6,867	6,997	27,253
1964	6,762	6,650	6,693	6,715	26,724
1963	6,140	6,086	6,280	6,684	25,201
1962	6,276	6,351	6,072	6,216	24,908
1961	5,784	5,562	5,800	6,124	23,272
1960	5,552	5,588	5,550	5,965	22,666
1959	5,763	5,611	5,589	5,647	23,526
1958	5,377	5,362	5,777	5,977	22,502
1957	5,134	5,123	5,001	5,317	20,578
1956	5,551	5,537	5,436	5,344	21,851
1955	5,098	5,249	5,528	5,732	21,599
1954	5,151	4,917	5,000	5,310	20,385
1953	4,948	5,003	4,937	5,245	20,122
1952	5,075	4,985	5,090	5,385	20,522
1951	5,433	5,056	5,055	5,157	20,695
1950	5,492	5,503	5,567	5,758	22,317

Source: Computed from Tabled A-6 using the implicit price index.

TABLE A-8

THE INTEREST RATE IN CURRENT PRICES
FOR THE TIME PERIOD 1950--70

YEAR	I	II	III	IV	ANNUAL
1970	8.00	7.00	6.50	6.00	6.88
1969	7.00	7.50	8.00	8.00	7.62
1968	7.50	7.50	6.00	6.50	6.88
1967	5.00	4.50	5.00	6.00	5.12
1966	5.25	5.25	5.25	5.25	5.25
1965	4.25	4.25	4.25	4.75	4.38
1964	4.00	4.00	4.00	4.25	4.06
1963	4.00	3.50	4.00	5.00	3.82
1962	3.37	6.00	5.50	4.00	4.72
1961	3.46	2.82	2.84	3.24	3.09
1960	3.26	3.32	1.95	3.50	3.01
1959	4.55	5.36	5.85	5.37	5.28
1958	2.52	1.97	2.52	3.74	2.69
1957	3.95	4.02	4.06	3.87	3.98
1956	2.75	3.00	3.50	3.92	3.29
1955	1.50	1.50	2.-0	2.75	1.94
1954	2.00	2.00	2.00	2.00	2.00
1953	2.00	2.00	2.00	2.00	2.00
1952	2.00	2.00	2.00	2.00	2.00
1951	2.00	2.00	2.00	2.00	2.00
1950	1.50	1.50	1.50	2.00	1.62

Source: International Financial Statistics
June 1971: For years 1968-70
Dec. 1969: For years 1966-68
Dec. 1966: For years 1963-66
Dec. 1964: For years 1961-64
Dec. 1961: For years 1959-60
Jan. 1961: For years 1958 and 4th quarter 1957
Dec. 1957: For years 1950-57 2nd quarter

Note: 3rd quarter 1957 is July's rate only; a rate for the whole quarter was not given and a change in publication for 2 years makes it impossible to find.
Also - prior to Nov. 1956 a fixed rate was announced by the Bank and was only changed at fairly long intervals, as is noted in the data.

TABLE A-9

THE INTEREST RATE IN CONSTANT (1961 = 100)
PRICES FOR THE TIME PERIOD 1950-70

YEAR	I	II	III	IV	ANNUAL
1970	6.04	5.26	4.84	4.46	5.15
1969	5.56	5.85	6.21	6.11	5.93
1968	6.19	6.16	4.90	5.20	5.61
1967	4.27	3.81	4.19	5.04	4.32
1966	4.65	4.60	4.54	4.54	4.58
1965	3.95	3.90	3.85	4.29	4.00
1964	3.85	3.80	3.74	3.98	3.84
1963	3.89	3.39	3.88	3.84	3.70
1962	3.35	5.93	5.43	3.91	4.65
1961	3.46	2.82	2.84	3.23	3.09
1960	3.27	3.34	1.96	3.53	3.03
1959	4.64	5.48	5.93	5.46	5.38
1958	2.65	2.04	2.61	3.89	2.80
1957	4.19	4.25	4.25	4.08	4.20
1956	3.00	3.27	3.76	4.14	3.54
1955	1.67	1.69	2.23	3.04	2.16
1954	2.24	2.25	2.24	2.24	2.24
1953	2.31	2.28	2.25	2.28	2.28
1952	2.34	2.26	2.23	2.29	2.28
1951	2.47	2.34	2.35	2.34	2.38
1950	2.05	2.02	1.98	2.56	2.15

Source: Computed from Table A-8 with use of the implicit price index.

TABLE A-10

FULL-EMPLOYMENT SURPLUS OR DEFICIT IN CURRENT PRICES
FOR THE TIME PERIOD 1950-70
(MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	557	837	238	338	1,972
1969	686	896	184	636	2,435
1968	440	440	0	378	1,256
1967	252	151	- 83	83	403
1966	178	367	-106	29	473
1965	- 15	276	-118	182	286
1964	-101	219	- 44	43	117
1963	-128	- 73	-266	- 60	- 528
1962	-199	- 70	-232	- 73	- 586
1961	-161	0	-274	-128	- 560
1960	-115	154	-248	-104	- 314
1959	-189	- 8	-139	- 37	- 375
1958	-189	-116	-252	-218	- 783
1957	64	220	-110	-110	62
1956	- 48	274	- 35	97	238
1955	-202	145	4	54	- 19
1954	-156	126	-130	- 58	- 220
1953	-163	260	- 52	- 17	28
1952	-165	150	0	15	1
1951	227	312	68	134	742
1950	36	141	165	198	545

Source: Computed by F.D. Coombs, using the procedure outlined by the Economic Council of Canada but, not averaging the growth rate over each time period as they did. i.e. In order to compute potential GNP, a growth rate of 5.9 percent was used for the period 1950 - 1956, 4.8 percent for 1956 - 1966 and 5.2 percent for 1966 - 1975. Economic Council of Canada averaged the percentages over each period. F.D. Coombs used the actual annual growth rate for each year.

TABLE A-11

FULL-EMPLOYMENT SURPLUS OR DEFICIT IN CONSTANT (1961 = 100) PRICES FOR THE TIME PERIOD 1950-70
(MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	421	628	177	251	1,476
1969	545	699	143	486	1,896
1968	363	362	0	303	1,024
1967	215	128	- 70	70	340
1966	158	322	- 92	25	413
1965	- 14	253	-107	165	261
1964	- 97	208	- 41	- 40	111
1963	-124	- 71	-258	- 58	- 511
1962	-198	- 69	-229	- 71	- 578
1961	-161	0	-275	-127	- 560
1960	-115	155	-249	-105	- 316
1959	-193	-158	-141	- 38	- 382
1958	-199	-120	-261	-227	- 815
1957	68	233	-115	-116	65
1956	- 56	298	- 38	103	256
1955	-225	163	4	60	- 21
1954	-174	142	-146	- 65	- 247
1953	-188	296	- 59	- 19	32
1952	-193	169	0	17	1
1951	280	366	80	157	881
1950	49	190	218	253	723

Source: Computed from Table A-10 by using the implicit price index.

TABLE A-12

FULL-EMPLOYMENT SURPLUS OR DEFICIT FIGURES FOR THE TIME PERIOD 1950-70 IN CURRENT PRICES
(MILLIONS OF DOLLARS)

YEAR	I	II	III	IV	ANNUAL
1970	575	760	710	344	2,418
1969	647	988	398	666	2,718
1968	464	458	147	329	1,414
1967	249	131	117	137	651
1966	178	367	-106	29	473
1965	- 33	300	181	142	628
1964	94	263	277	94	574
1963	70	67	- 6	- 2	11
1962	-193	66	29	29	- 48
1961	-139	82	81	- 32	16
1960	-173	232	6	- 48	41
1959	-226	16	83	- 19	- 126
1958	-246	-134	-100	-249	- 721
1957	5	202	20	-128	118
1956	- 48	274	- 35	47	238
1955	-140	128	48	80	120
1954	- 98	156	29	28	132
1953	-178	199	- 82	- 2	- 58
1952	-134	115	- 67	- 24	- 117
1951	261	322	80	205	868
1950	36	141	165	198	545

Source: Computer by F. D. Coombs using the exact procedure of the Economic Council of Canada.

1 Economic Council of Canada has computed annual full employment surplus or deficit figures only for the period 1956 to 1970. The above figures have been computed by the same procedure as used by the Council. Therefore, there is no difference between the above annual figures and those of the Council.

In order to compute potential GNP, a growth rate of 5.9 percent was used for the period 1950 to 56, 4.8 percent for 1956 to 1966 and 5.2 percent from 1966 to 1965.

TABLE A-13

IMPLICIT PRICE INDEXES IN CONSTANT (1961 = 100) PRICES
(BASED ON SEASONALLY ADJUSTED DATA)

YEAR	I	II	III	IV	ANNUAL
1970	132.4	133.2	134.3	134.5	133.6
1969	125.9	128.1	128.8	130.9	128.4
1968	121.1	121.7	122.7	124.9	122.6
1967	117.2	118.0	119.2	119.1	118.4
1966	112.8	114.1	115.6	115.5	114.5
1965	107.6	109.1	110.5	110.6	109.5
1964	104.0	105.4	106.9	106.9	105.8
1963	102.9	103.1	103.1	104.2	103.3
1962	100.7	101.1	101.3	102.4	101.4
1961	99.9	99.9	99.8	100.4	100.0
1960	99.8	99.4	99.4	99.2	99.4
1959	98.0	97.8	98.6	98.4	98.2
1958	95.2	96.6	96.5	96.2	96.1
1957	94.2	94.6	95.6	94.9	94.8
1956	91.8	91.8	93.2	94.6	92.9
1955	89.7	88.9	89.8	90.6	89.8
1954	89.4	88.9	89.2	89.4	89.2
1953	86.6	87.9	88.7	87.8	87.8
1952	85.6	88.5	89.6	87.3	87.8
1951	81.0	85.3	85.1	85.5	84.2
1950	73.3	74.3	75.6	78.2	75.4
1949	73.3	73.6	74.3	73.6	73.7
1948	67.6	69.6	72.6	73.2	70.8
1947	59.2	62.6	63.6	67.2	63.1

Source: Dominion Bureau of Statistics, National Accounts, Revised June 11, 1970 for 1947-1969. (Sent by D.B.S. July 15, 1971)

For 1970 data 1st quarter 1971 of National Accounts Income and Expenditure (13-001).

APPENDIX B

RESULTS USED TO DETERMINE THE SHAPE OF THE CURVE

EQUATIONS FOR TABLE B-1

1. $Y = a + b_1X_1 + b_2X_2$ (3 2 1)
2. $Y = a + b_1X_1 + b_2X_2$ (3 2 2)
3. $Y = a + b_1X_1 + b_2X_2$ (3 2 3)
4. $Y = a + b_1X_1 + b_2X_2$ (4 3 1)
5. $Y = a + b_1X_1 + b_2X_2$ (4 3 2)
6. $Y = a + b_1X_1 + b_2X_2$ (4 3 3)
7. $Y = a + b_1X_1 + b_2X_2$ (4 3 4)
8. $Y = a + b_1X_1 + b_2X_2$ (5 4 1)
9. $Y = a + b_1X_1 + b_2X_2$ (5 4 2)
10. $Y = a + b_1X_1 + b_2X_2$ (5 4 3)
11. $Y = a + b_1X_1 + b_2X_2$ (5 4 4)
12. $Y = a + b_1X_1 + b_2X_2$ (6 5 1)
13. $Y = a + b_1X_1 + b_2X_2$ (6 5 2)
14. $Y = a + b_1X_1 + b_2X_2$ (6 5 3)
15. $Y = a + b_1X_1 + b_2X_2$ (6 5 4)

where Y = stock prices

a = intercept

X_1 = full-employment surplus or deficit

X_2 = money supply (distributed lag)

TABLE B-1

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950-70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	T - Value X_1	T - Value X_2	Standard Error of Regression Coefficient X_1	Standard Error of Regression Coefficient X_2
1	.96	10.04	.45	-76.86	.0288	.0007	41.14	.14	.0007	.0054
2	.96	10.07	.45	-77.40	.0290	-.0000	36.75	-.00	.0008	.0055
3	.96	10.07	.45	-77.40	.0290	-.0000	36.75	-.00	.0008	.0055
4	.96	9.96	.41	-76.86	.0290	.0002	36.25	.03	.0008	.0055
5	.96	10.03	.41	-76.87	.0290	.0002	36.25	.03	.0008	.0056
6	.96	10.03	.41	-76.87	.0290	.0002	36.25	.03	.0008	.0056
7	.96	10.09	.42	-76.64	.0289	.0003	6.88	.05	.0042	.0056
8	.96	9.98	.42	-75.48	.0288	.0012	36.00	.20	.0008	.0057
9	.96	10.05	.42	-75.48	.0287	.0011	35.88	.18	.0008	.0057
10	.96	10.05	.42	-75.48	.0287	.0011	35.88	.18	.0008	.0057
11	.96	9.99	.43	-68.90	.0281	.0005	.09	.10	.3077	.0057
12	.96	9.97	.43	-73.34	.0284	.0030	31.56	.52	.0009	.0058
13	.96	10.03	.44	-73.44	.0284	.0028	31.56	.48	.0009	.0059
14	.96	10.03	.44	-73.44	.0284	.0028	31.56	.48	.0009	.0059
15	.96	10.10	.44	-73.43	.0284	.0028	.13	.48	.2054	.0059

EQUATIONS FOR TABLE B-2

1. $Y = a + b_1X_1\ (3\ 2\ 1) + b_2X_2\ (3\ 2\ 1)$
2. $Y = a + b_1X_1\ (3\ 2\ 2) + b_2X_2\ (3\ 2\ 2)$
3. $Y = a + b_1X_1\ (3\ 2\ 3) + b_2X_2\ (3\ 2\ 3)$
4. $Y = a + b_1X_1\ (4\ 3\ 1) + b_2X_2\ (4\ 3\ 1)$
5. $Y = a + b_1X_1\ (4\ 3\ 2) + b_2X_2\ (4\ 3\ 2)$
6. $Y = a + b_1X_1\ (4\ 3\ 3) + b_2X_2\ (4\ 3\ 3)$
7. $Y = a + b_1X_1\ (4\ 3\ 4) + b_2X_2\ (4\ 3\ 4)$
8. $Y = a + b_1X_1\ (5\ 4\ 1) + b_2X_2\ (5\ 4\ 1)$
9. $Y = a + b_1X_1\ (5\ 4\ 2) + b_2X_2\ (5\ 4\ 2)$
10. $Y = a + b_1X_1\ (5\ 4\ 3) + b_2X_2\ (5\ 4\ 3)$
11. $Y = a + b_1X_1\ (6\ 5\ 1) + b_2X_2\ (6\ 5\ 1)$
12. $Y = a + b_1X_1\ (6\ 5\ 2) + b_2X_2\ (6\ 5\ 2)$
13. $Y = a + b_1X_1\ (6\ 5\ 3) + b_2X_2\ (6\ 5\ 3)$

where Y = stock prices

a = intercept

X_1 = full-employment and surplus or deficit (distributed lag)

X_2 = money supply (distributed lag).

TABLE B-2

ALMON DISTRIBUTION LAG TECHNIQUE RESULTS FOR MONEY SUPPLY AND FULL-EMPLOYMENT SURPLUS OR DEFICIT IN QUARTERLY CURRENT PRICES FOR THE PERIOD 1950-70

Equation	Multiple Correl. Coeff. Squared R^2	Standard Error of Estimate	Durbin-Watson Statistic d_c	Intercept a	Total Supply of Money X_1	Full-Employment Surplus or Deficit X_2	T - Value		Standard Error of Regression Coefficient	
							X_1	X_2	X_1	X_2
1	.96	10.04	.45	-76.96	.0289	.0005	36.12	.08	.0008	.0065
2	.96	10.13	.46	-77.63	.0290	-.0006	36.50	-.09	.0008	.0068
3	.96	10.13	.46	-77.63	.0290	-.0006	36.50	-.09	.0008	.0068
4	.97	9.85	.41	-78.50	.0293	-.0049	32.56	-.69	.0009	.0071
5	.97	9.93	.40	-78.58	.0293	-.0054	32.56	-.75	.0009	.0072
6	.97	9.93	.40	-78.58	.0293	.0054	32.56	-.75	.0009	.0072
7	.97	9.63	.56	-84.38	.0305	.0354	.05	.00	.5625	11.9963
8	.97	9.90	.45	-77.46	.0292	-.0055	32.44	-.72	.0009	.0076
9	.97	9.99	.42	-77.29	.0291	-.0052	32.33	-.68	.0009	.0077
10	.97	9.99	.42	-77.29	.0291	-.0052	32.33	-.68	.0009	.0077
11	.97	9.77	.49	-74.29	.0286	-.0049	28.60	-.63	.0010	.0078
12	.97	9.83	.47	-74.18	.0286	-.0043	28.60	-.55	.0010	.0078
13	.97	9.83	.47	-74.18	.0286	-.0043	28.60	-.55	.0010	.0078

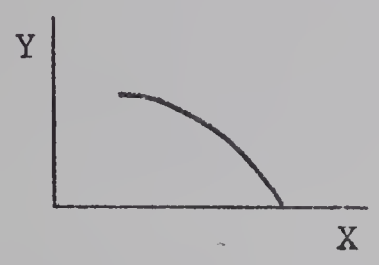
EXHIBIT B-3

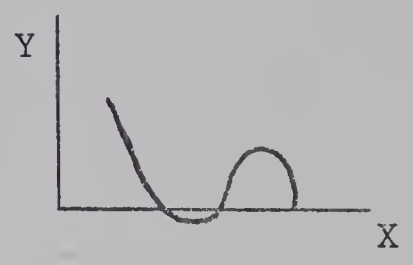
ILLUSTRATIONS FOR THE SHAPE OF THE CURVE WITH DIFFERENT VALUES FOR C

$$Y = a + b_1 X_1 \quad (A\ B\ C)$$

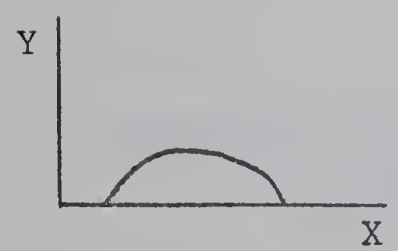
where A is degree of the polynomial plus one
B is the number of lags
C determines the shape of the curve and can have the values 1, 2, 3, or 4.

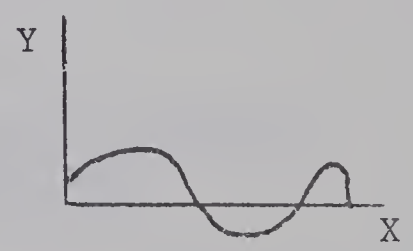
When C = 1 the far end is fixed



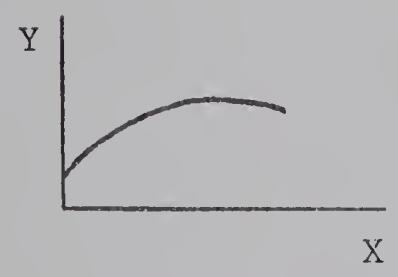


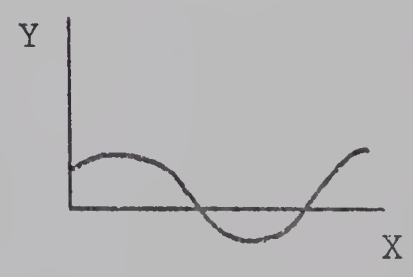
When C = 2 both ends are fixed



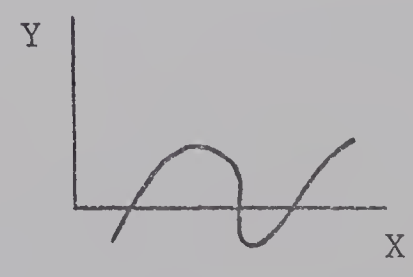


When C = 3 the near end is fixed





When C = 4 neither end is fixed



APPENDIX C

PROCEDURE USED IN COMPUTING POTENTIAL GNP AND FULL-EMPLOYMENT SURPLUS OR DEFICIT

EXHIBIT C-1

PROCEDURE USED IN COMPUTATION OF FULL-EMPLOYMENT SURPLUS OR DEFICIT
(Millions of Dollars)

		1950	1956	1966
1.	Constant GNP	23809	33780	53650
2.	Constant Potential GNP	23762	33644	53547
3.	Percentage GNP Gap In Constant 1961 $ (3 = 1/2)	.9861	.9960	.9981
4.	Current GNP	17955	31374	61421
5.	Current Potential GNP (5 = 3 x 4)	17919	31249	61304
6.	Current GNP Gap (6 = 5 - 4)	-36	-125	-117
7.	Net Revenue	--	--	--
8.	Average Tax Rate (8 = 7/4)	25.81	27.08	31.91
9.	Revenue Shortfall (9 = 8 x 6)	-9	-34	-37
10.	Actual Surplus or Deficit	554	272	510
11.	Full-employment Surplus or Deficit (11 = 9 $\pm$ 10)	545	238	473

Source: Based on data from D.B.S., National Accounts, Revised Data June 11, 1971.

EXHIBIT C-2

PROCEDURE USED IN COMPUTATION OF
POTENTIAL GNP

		1950	1956	1966
1.	Civilian Labour Force (000)	5162	5782	7420
2.	Employment at 96.2% (000)	4966	5562	7138
3.	Armed Forces (000)	51	117	106
4.	Potential Employment (000) (4 = 2 + 3)	5017	5679	7244
5.	Actual Employment (000)	5027	5702	7258
6.	Excess (000) (6= 4 - 5)	-10	-23	-14
7.	Actual GNP (Millions of 1961$)	23809	33780	53650
8.	GNP/Employed Persons (8 = 7/5)	4736	5924	7392
9.	Shortfall x GNP/Employed (9 = 6 x 8)	-47	-136	-103
10.	Potential GNP (Millions of $) (10 = 7 $\pm$ 9)	23762	33644	53547

Note: Growth Rate: 1950-66 5.9%
1956-66 4.8%
1966-75 5.2%

Unemployment Rate: 3.8%